GOVERNMENT OF INDIA

ARCHÆOLOGICAL SURVEY OF INDIA

CENTRAL
ARCHÆOLOGICAL
LIBRARY

ACCESSION NO. 18553

CALL No. 910.2099 N.I.D.

D.G.A. 79.

B.R. 519 A

GEOGRAPHICAL HANDBOOK SERIES

PACIFIC ISLANDS

VOLUME II

EASTERN PACIFIC

November 1943

110.2 G.H.
N.I.D.



NAVAL INTELLIGENCE DIVISION

MUNSHI RAM MANOHAR LAL
Oriental & Foreign Book-Sellers,
P. B. 1165, Nai Sarak, DELHI-6.

This volume was produced and printed for official purposes during the war 1939/45

NEW DELHI.
18.5.53
16-7-63
910.2099 N.I.D.

PREFACE

IN 1915 a Geographical Section was formed in the Naval Intelligence Division of the Admiralty to write Geographical Handbooks on various parts of the world. The purpose of these handbooks was to supply, by scientific research and skilled arrangement, material for the discussion of naval, military, and political problems, as distinct from the examination of the problems themselves. Many distinguished collaborators assisted in their production, and by the end of 1918 upwards of fifty volumes had been produced in Handbook and Manual form, as well as numerous short-term geographical reports. The demand for these books increased rapidly with each new issue, and they acquired a high reputation for accuracy and impartiality. They are now to be found in Service Establishments and Embassies throughout the world, and in the early years after the last war were much used by the League of Nations.

The old Handbooks have been extensively used in the present war, and experience has disclosed both their value and their limitations. On the one hand they have proved, beyond all question, how greatly the work of the fighting services and of Government Departments is facilitated if countries of strategic or political importance are covered by handbooks which deal, in a convenient and easily digested form, with their geography, ethnology, administration, and resources. On the other hand, it has become apparent that something more is needed to meet present-day requirements. The old series does not cover many of the countries closely affected by the present war (e.g. Germany, France, Poland, Spain, Portugal, to name only a few); its books are somewhat uneven in quality, and they are inadequately equipped with maps, diagrams, and photographic illustrations.

The present series of Handbooks, while owing its inspiration largely to the former series, is in no sense an attempt to revise or re-edit that series. It is an entirely new set of books, produced in the Naval Intelligence Division by trained geographers drawn largely from the Universities, and working at sub-centres established at Oxford and Cambridge, and is printed by the Oxford and Cambridge University Presses. The books follow, in general, a uniform scheme, though minor modifications will be found in particular cases; and they are illustrated by numerous maps and photographs.

The purpose of the books is primarily naval. They are designed first to provide, for the use of Commanding Officers, information in a comprehensive and convenient form about countries which they may be called upon to visit, not only in war but in peace-time; secondly, to maintain the high standard of education in the Navy and, by supplying officers with material for lectures to naval personnel ashore and afloat, to ensure for all ranks that visits to a new country shall be both interesting and profitable.

Their contents are, however, by no means confined to matters of purely naval interest. For many purposes (e.g. history, administration, resources, communications, etc.) countries must necessarily be treated as a whole, and no attempt is made to limit their treatment exclusively to coastal zones. It is hoped therefore that the Army, the Royal Air Force, and other Government Departments (many of whom have given great assistance in the production of the series) will find these Handbooks even more valuable than their predecessors proved to be both during and after the last war.

J. H. GODFREY
Director of Naval Intelligence
1942

The foregoing preface has appeared from the beginning of this series of Geographical Handbooks. It describes so effectively their origin and purpose that I have decided to retain it in its original form.

This volume has been prepared for the Naval Intelligence Division at the Cambridge sub-centre (Director, Mr J. M. Wordie; General Editor, Dr H. C. Darby). It has been written by Mr Adrian Digby, Dr Raymond Firth and Mr T. G. Tutin, and edited by Dr Raymond Firth. The maps and diagrams have been executed by Miss M. Garside, Miss F. Hands, Miss Aletta Lewis, Mrs Marion Plant, Mrs Gwen Raverat and Miss J. D. I. Tyson.

E. G. N. RUSHBROOKE
Director of Naval Intelligence

November 1943

CONTENTS

PREFACE PAGE iii

SUMMARY OF CONTENTS OF HANDBOOK ON PACIFIC ISLANDS viii

LIST OF MAPS AND DIAGRAMS ix

LIST OF PLATES xiv

I. INTRODUCTION 1

Limits and Size of the Region: Diversity of the Island Groups: Plan of this Volume: Sources of Information: Maps: Place-names

II. THE OUTLYING ISLANDS (EAST OF LONG. 130° W) 10

Guadalupe: Revilla Gigedo: Clipperton: Cocos: Malpelo: Galápagos: San Felix and San Ambrosio: Juan Fernández: Easter island: Sala y Gomez: Pitcairn: Oeno: Henderson: Ducie: Bibliographical Note

III. THE SOCIETY ISLANDS AND ASSOCIATED GROUPS (FRENCH OCEANIA) 95

Physical Geography: History: The People: Administration: Social Services: Economics: Communications: Bibliographical Note

IV. THE SOCIETY ISLANDS 129

Physical Geography: The Native People

The Windward Group—Tahiti; Moorea; Mehetia; Tetiaroa; Tapuaemanu

The Leeward Group—Huahine; Raiatea; Tahaa; Borabora; Tubai; Maupiti; Mopihaa, Fenua Ura and Motu One

Bibliographical Note

V. THE TUAMOTU ARCHIPELAGO 192

Physical Geography: The People: Administration: Economics: Communications

Individual Islands: North-western Islands; Other Islands North of 20° S Lat.; Islands South of 20° S Lat.: Bibliographical Note

VI. THE MANGAREVA GROUP, THE AUSTRAL ISLANDS AND RAPA PAGE 227

The Mangareva Group: Temoe: *The Austral islands and Rapa*—Maria; Rimatara; Rurutu; Tubuai; Raivavae; Rapa; Marotiri: Bibliographical Note

VII. THE MARQUESAS 260

Physical Geography: The People: Administration and Social Services: Economics: Communications: Hivaoa: Tahuata: Fatuhiva: Mohotani: Fatuuku: Nukuhiva: Uapou: Uahuka: Eiao: Hatutu: 'Coral' Islets: Motu Iti: Bibliographical Note

VIII. GENERAL REVIEW OF THE HAWAIIAN GROUP 300

Physical Geography: History: Growth and Distribution of Population: Peoples: Administration and Social Services

IX. GENERAL REVIEW OF THE HAWAIIAN GROUP (*cont.*) 357

Economics: Communications: Ports: Bibliographical Note

X. INDIVIDUAL ISLANDS OF THE HAWAIIAN GROUP, AND JOHNSTON ISLAND 413

Windward Islands: Leeward Islands and Johnston Island: Bibliographical Note

XI. THE CENTRAL EQUATORIAL ISLANDS 452

Physical Geography: Political and Economic History: Social and Economic Conditions, 1939–40: Communications: The Northern Line Islands: The Southern Line Islands: Baker Island and Howland Island: The Phoenix Group: Bibliographical Note

XII. THE TOKELAU GROUP, THE COOK ISLANDS AND NIUE 504

The Tokelau Group: Swains Island: General Review of the Cook Islands: The Lower Cook Group: The Northern Cook Group: Niue: Bibliographical Note

XIII. GENERAL REVIEW OF THE SAMOA GROUP 582

Physical Geography: History: Growth and Distribution of Population: People

XIV. THE SAMOA GROUP (*cont.*) PAGE 627

Administration: Social Services: Economics: Communications and Ports: Savai'i: Upolu: Tutuila: Manu'a Group: Rose Atoll: Bibliographical Note

APPENDICES:

I. Maps and Charts of the Eastern Pacific 678

II. Place-names in the Eastern Pacific 685

III. The Eastern Pacific since 1939 691

INDEX 695

SUMMARY OF CONTENTS OF HANDBOOK ON PACIFIC ISLANDS

VOLUME I. GENERAL SURVEY

Geology and Physical Structure; Climate; Vegetation; Fauna; Health; History; Peoples; Administration; Economics; Ports and Communications

VOLUME II. EASTERN PACIFIC

Outlying Islands; Society Islands; Tuamotu Archipelago; Mangareva Group, Austral Islands and Rapa; Marquesas; Hawaiian Islands; Central Equatorial Islands; Tokelau Group, Cook Islands and Niue; Samoa

VOLUME III. WESTERN PACIFIC

(TONGA TO THE SOLOMON ISLANDS)

Tonga; Fiji; Rotuma, Uvea and Futuna; Gilbert Islands and Ellice Islands; Nauru; Kermadecs, Norfolk and Lord Howe; New Caledonia; New Hebrides; Solomon Islands

VOLUME IV. WESTERN PACIFIC

(NEW GUINEA AND ISLANDS NORTHWARD)

New Guinea (Mandated Territory and Territory of Papua); Bismarck Archipelago; Caroline Islands; Marshall Islands; Wake Island; Guam; Marianas Islands

LIST OF MAPS AND DIAGRAMS

		PAGE
1.	Main shipping routes in the Eastern Pacific	*facing* 2
2.	Political control of the Eastern Pacific islands	*facing* 3
3.	Key to general symbols used on maps	8, 9
4.	Clipperton	14
5.	Cocos	18
6.	Galápagos archipelago	23
7.	Currents and sea temperatures, *garúa* season	26
8.	Currents and sea temperatures, rainy season	26
9.	Currents and sea temperatures in a *niño* year	27
10.	Galápagos: eastern group	41
11.	Galápagos: central group	45
12.	Galápagos: western group	51
13.	Galápagos: northern group	53
14.	Juan Fernández: Más-á-tierra	56
15.	Juan Fernández: Más-afuera	57
16.	View of north coast of Más-á-tierra	61
17.	The settlement and Punta San Carlos, Cumberland bay, Más-á-tierra	62
18.	Easter island	65
19.	Panorama of Easter island: looking north-east from Rano Kao	66, 67
20.	Part of crater wall, Rano Kao, Easter island	68
21.	Easter island: profile from the south-east	68
22.	Easter island: temperature and rainfall, 1911–13	69
23.	Stone statues on the inner crater wall of Rano Roraku, Easter island	75
24.	Pitcairn	79
25.	Pitcairn: the north-east side	80
26.	Pitcairn: Adamstown	85
27.	Islands adjacent to Pitcairn	91
28.	The French Establishments in Oceania, superimposed upon Europe, on Bonne's equal area projection	97
29.	French Establishments in Oceania: export of phosphate 1920–42, and of copra 1923–42	114
30.	French Establishments in Oceania: export of pearl shell and of vanilla, 1923–42	119
31.	French Establishments in Oceania: changes in foreign trade between 1913 and 1939	123
32.	Society islands	130
33.	Plan of Maeva village, Huahine	133
34.	Tahiti: physical	138
35.	Tahiti: roads and principal settlements	139
36.	Profiles of Tahiti and Moorea compared	140
37.	Papeete	*facing* 150
38.	Papeete: part of the waterfront	152

		PAGE
39.	Moorea: physical	156
40.	Moorea: roads and settlements	157
41.	Mountains of Moorea, from the south-west	158
42.	Mehetia: sketch map	162
43.	Mehetia: two views	163
44.	Tetiaroa	164
45.	Tapuaemanu: plan and section	166
46.	Huahine: physical	168
47.	Huahine: roads and settlements	169
48.	Raiatea and Tahaa: physical	174
49.	Raiatea and Tahaa: roads and settlements	175
50.	Raiatea: the north side, from the reef	176
51.	Borabora	181
52.	Maupiti	187
53.	Maupiti: view of the central island from the reef	188
54.	Tuamotu archipelago	193
55.	Types of walled fish weir traps, Tuamotu	199
56.	Terrace of the ancient temple Puarautonga on Reao	201
57.	Makatea	206
58.	Makatea: section	207
59.	Fakarava	210
60.	Hao	217
61.	Mangareva group	228
62.	Mangareva island	229
63.	Austral islands including Rapa	237
64.	Rurutu	240
65.	Rurutu: generalized section	241
66.	Tubuai	244
67.	Raivavae	251
68.	Rapa	253
69.	Panorama of Ahurei bay, Rapa	254
70.	South side of Ahurei bay, Rapa	255
71.	Ahurei bay, looking towards the head	255
72.	Silhouette of Marotiri	258
73.	The Marquesas	261
74.	Hivaoa	275
75.	Atuona bay and Temetiu, Hivaoa	277
76.	Tahuata	279
77.	Fatuhiva	280
78.	Fatuhiva: simplified relief sketch	281
79.	Fatuhiva: profile from the west	282
80.	Hanavave, Fatuhiva	283
81.	Mohotani: profile from south-west	284
82.	Nukuhiva	286
83.	Nukuhiva: profile from the south	286
84.	Mouth of the Taipi valley, Nukuhiva	287
85.	Taiohae, Nukuhiva	289
86.	Uapou	290

		PAGE
87.	Pinnacles on Uapou	291
88.	Coast and village at mouth of Hakahetau valley, Uapou	292
89.	Uahuka	293
90.	Vaipaee, south coast of Uahuka	294
91.	Minor islands of the Marquesas	295
92.	Cliffs near south-west end of Eiao	296
93.	The Hawaiian islands	300
94.	Profile of the Hawaiian islands	301
95.	Maui: drainage	306
96.	Oahu: distribution of mean annual rainfall	307
97.	Rainfall in trade winds and *kona* (southerly) winds	307
98.	Growth of population of the Hawaiian islands, 1853–1939	328
99.	Age and sex distribution in four ethnic groups in the Territory of Hawaii, 1930	331
100.	Occupational classification in the Territory of Hawaii, 1930	337
101.	'Interracial' marriages, Territory of Hawaii, 1912–13	344
102.	'Interracial' marriages, Territory of Hawaii, 1931–2	345
103.	Artificial irrigation in the Hawaiian islands	358
104.	Hawaii: land utilization	360
105.	Maui: land utilization	361
106.	Molokai: land utilization	362
107.	Lanai: land utilization	362
108.	Oahu: land utilization	363
109.	Kauai: land utilization	364
110.	Sugar production in the Territory of Hawaii, 1915–39	365
111.	Pineapple production in the Territory of Hawaii, 1911–38	368
112.	Hawaii: communications and principal settlements	384
113.	Maui: communications and principal settlements	385
114.	Molokai: communications and principal settlements	386
115.	Oahu: communications and principal settlements	387
116.	Kauai: communications and principal settlements	388
117.	Cable landing	391
118.	Principal ports and landings in the Hawaiian islands	391
119.	The port of Honolulu	*facing* 392
120.	The city of Honolulu	*facing* 393
121.	Hilo	400
122.	Kahului	403
123.	Hawaii: physical	414
124.	Maui: relief	419
125.	South-eastern Maui: detail	419
126.	Cultivated slopes behind Lahaina, Maui	420
127.	Molokai: relief	423
128.	North-east coast of Molokai: detail	423
129.	Minor islands of the windward group	427
130.	Oahu: relief	431
131.	Kauai: relief	436
132.	Kaula	441
133.	Nihoa and Necker islands	443

		PAGE
134.	Gardner island: plan and view from the west	445
135.	Midway	448
136.	Central equatorial islands and adjacent groups	453
137.	Profile and vegetation of two types of equatorial islands	454
138.	Comparison of temperatures, Malden and Fanning	458
139.	Annual rainfall, Malden, 1891–1918	458
140.	Monthly rainfall, Malden, 1890–1919	459
141.	Rainfall dispersion by months, Malden, 1890–1918	460
142.	Soil profiles in three equatorial islands	462
143.	Discovery of central equatorial islands	465
144.	Utilization of central equatorial islands in the nineteenth century	467
145.	Occupation of central equatorial islands in 1939	474
146.	Christmas	476
147.	Fanning	479
148.	Washington	482
149.	Washington: section	482
150.	Malden	487
151.	Ancient Polynesian stone structure on Malden	488
152.	Three of the southern Line islands	489
153.	Three equatorial islands	492
154.	Canton	495
155.	Four islands of the Phoenix group	498
156.	The Tokelau group	505
157.	Part of the sea front of Fakaofu village	517
158.	Lower Cook group	519
159.	Proportionate value of Cook islands exports, 1919–39	531
160.	Export of copra and oranges, Cook islands, 1919–39	532
161.	Export of bananas and tomatoes, Cook islands, 1919–39	533
162.	Rarotonga: physical	536
163.	Rarotonga: roads and settlements	540
164.	Avarua, Rarotonga	540
165.	Avarua and Avatiu harbours, Rarotonga	541
166.	Mangaia: plan and section	543
167.	Atiu: plan and section	547
168.	Aitutaki	550
169.	Tongareva	552
170.	Manihiki	554
171.	Rakahanga	555
172.	Pukapuka	557
173.	Pukapuka islet (Wale)	559
174.	Niue	563
175.	Annual rainfall of Niue, 1910–40	565
176.	Value of principal exports from Niue, 1915–40	578
177.	The Samoa group	582
178.	Upolu: physical	583
179.	Savai'i: physical	584
180.	Lava flows from Matavanu crater, 1905–6	585

		PAGE
181.	Temperature and rainfall, Apia observatory, 1915–19	589
182.	Distribution of population on Tutuila, 1935	606
183.	Head of a Samoan girl	609
184.	Taupo preparing kava	618
185.	Method of dividing up flesh food on ceremonial occasions	619
186.	Samoan band at a dance	620
187.	Samoan dance at night	621
188.	A Samoan villager preparing copra	623
189.	Canoes going out over the reef	626
190.	Land holding in Western Samoa	635
191.	Quantity and value of copra exports, Western Samoa, 1925–39	649
192.	Quantity and value of cocoa exports, Western Samoa, 1925–39	649
193.	Quantity and value of banana exports, Western Samoa, 1928–39	650
194.	Quantity and value of rubber exports, Western Samoa, 1925–39	651
195.	Destination of exports from Western Samoa in 1939	654
196.	Apia	*facing* 656
197.	In a village on the shore of Pango Pango harbour	*facing* 657
198.	Pango Pango harbour	658
199.	Pango Pango harbour from the northern shore	659
200.	The port of Pango Pango	659
201.	Savai'i: roads and settlements	663
202.	Upolu: roads and settlements	668
203.	Tutuila: physical	671
204.	Tutuila: roads and settlements	672
205.	Manu'a group	674

LIST OF PLATES

FACING PAGE

1. Clipperton rock 14
2. Tagus cove and surroundings, Isabela 14
3. Lava flows on Isabela, 1925 15
4. Coastal vegetation, Santa Cruz 15
5. Head of marine iguana 32
6. Marine iguana in natural surroundings 32
7. The plateau, San Cristóbal 33
8. Progreso, San Cristóbal 33
9. 'Tortoise country', Santa Cruz 46
10. Uplands of Santa Cruz 46
11. Cumberland bay, Juan Fernández 47
12. Más-afuera, Juan Fernández 47
13. Quebrada de las Casas, Más-afuera 64
14. South coast, Easter island 64
15. Hanga Piko landing, Easter island 65
16. Fallen statues, Easter island 65
17. Easter island stone statue 76
18. Easter island wooden figure 76
19. Pulling into the landing, Bounty bay, Pitcairn 77
20. Landing place and boat sheds, Bounty bay 77
21. } Facial types commonly met among Polynesians of French
22. } Oceania 108
23. Polynesian spearing fish 109
24. Drying vanilla, Society islands 109
25. Bay adjoining Venus point, Tahiti 136
26. Le Diadème, Tahiti 136
27. Arue, Tahiti 137
28. Lagoon at Faaa, Tahiti 137
29. Fautaua fall, Tahiti 142
30. Mouth of the Tautira valley, Tahiti 142
31. Lagoon and pass near Punaauia, Tahiti 143
32. Tahara head from the east 143
33. Papeete from the harbour (in 1937) 151
34. Papeete from the south 154
35. A main street in Papeete 154
36. Bridge over the Taharuu river 155
37. Broom Road at Tiarei, north coast of Tahiti 155
38. Mouaroa, Moorea 160
39. Part of Papetoai bay, Moorea 160
40. On the coastal flat of Moorea 161
41. Fare harbour, Huahine 161
42. Mt Pahia and Vaitape, Borabora 182
43. Faanui bay, Borabora 182

FACING PAGE

44. West coast of Niau, Tuamotu archipelago 183
45. View on Rangiroa, Tuamotu archipelago 183
46. Anchorage at Amanu, Tuamotu archipelago 194
47. Village street, Pukarua, Tuamotu archipelago 194
48. Sea-going boat, Vahitahi, Tuamotu archipelago 195
49. Limestone cliff face, Makatea, Tuamotu archipelago 195
50. Phosphate loading equipment, Makatea 208
51. Phosphate railway, Makatea 208
52. Mt Duff, Mangareva 209
53. Avera bay, Rurutu, Austral islands 209
54. Ancient fort at Morotonga, Rapa 262
55. Cultivation at Ahurei, Rapa 262
56. Coast of Nukuhiva, Marquesas 263
57. Native canoe in Taiohae bay, Nukuhiva 263
58. Road on Hivaoa, Marquesas 302
59. Catholic mission church at Taiohae, Nukuhiva 302
60.–61. Lava flows, Hawaii 303
62.–64. Types of coastal landscape, Hawaiian islands 304
65. Sugar cane and flume near Hilo, Hawaii 305
66. Planting pineapples through mulching paper 305
67. Pineapple plantation (seen from the air) 370
68. Rice fields on Kauai 370
69. Taro plots on Maui 371
70. Fishing sampans in Waiakea creek, Hilo 371
71.–72. Roads on Oahu 382
73. Train on the Oahu Railway near Kaena point 383
74. Barge unloading pineapples in Kapalama basin, Honolulu 383
75. Honolulu from Punchbowl hill 398
76. Honolulu: aerial view of wharves and part of commercial district 398
77. Honolulu and Diamond head 399
78. Hilo, Hawaii 399
79. Kahului, Maui 404
80. Mala, Maui 404
81. Port Allen, Kauai 405
82. Nawiliwili, Kauai 405
83. Hanalei bay, Kauai 410
84. Kaumalapau harbour, Lanai 410
85. Makapuu point, Oahu 411
86. Kaena point, Oahu 411
87. View from the Nuuanu Pali, Oahu 432
88. Pearl and Hermes reef, Hawaiian islands 432
89. Nihoa, Hawaiian islands 433
90. Necker, Hawaiian islands 433
91. Molokini, Hawaiian islands 433

FACING PAGE

92. Palmyra, Line islands 454
93. Strawn's islet, north-west end of Palmyra 454
94. East coast of Howland 455
95. Coast of Enderbury, Phoenix islands 455
96. Near the centre of Enderbury 462
97. Interior of Baker 462
98. Vegetation on Cooper islet, Palmyra 463
99. Coral flat on the shore of Cooper islet, Palmyra 463
100. Pier at Fanning, Line islands 480
101. Part of the lagoon shore, Fanning 480
102. Building at the cable station, Fanning 481
103. Store at the settlement of 'London', Christmas 481
104. Part of Tongareva, Northern Cook group 520
105. Coast of Niue 520
106. Omoka village, Tongareva 521
107. Dwellings on Pukapuka, Northern Cook group 521
108. South-west coast of Rarotonga, Lower Cook group 536
109. Interior of Rarotonga 536
110. South coast of Tutuila, American Samoa 537
111. On the east coast of Savai'i, Western Samoa 537
112. Entrance to Pango Pango harbour, Tutuila 586
113. Shores of Pango Pango harbour 586
114. Forest in the mountains of Upolu 587
115. A deep valley on the north coast of Tutuila 587
116. Apolima, Western Samoa 610
117. A Samoan fishing fleet 610
118. Samoan bonito canoe 610
119. Samoan round house 611
120. Kava ceremony 611
121. Sapapali'i church 644
122. Mission house at Malua, north Upolu 644
123. Apia from the sea 645
124. Pango Pango on boat day 645

Chapter I

INTRODUCTION

Limits and Size of the Region: Diversity of the Island Groups: Plan of this Volume: Sources of Information: Maps: Place-names

Limits and Size of the Region

In describing the Eastern Pacific islands some precision must be given to this rather vague term. For the purposes of this Handbook the Eastern Pacific is defined as the area lying east of the date line and roughly between latitudes 40° N and 40° S. This excludes the Aleutian islands, Queen Charlotte islands and others adjacent to Alaska and Canada, as being primarily extensions of the North American mainland; and the Chatham islands (which in any case lie to the west of the date line), as falling more into relation with New Zealand and the sub-Antarctic islands.

The date line itself is an arbitrary division, adopted for convenience in time reckoning. It is based on the 180th meridian, but diverges from this to east or west in order that places in the same group of islands or in associated groups may all have the same day in the calendar. For practical purposes it has been found more convenient that the Kermadec islands, the Tonga group, the Lau group of Fiji and Uvea and Futuna, all lying east of the 180th meridian, should follow the dating system of the western region. Inclusion of these islands in the western region has involved running the date line in this vicinity as far as 172° 30′ W.* Treatment of these islands will be given in vol. III of the Handbook.

The Eastern Pacific islands, as thus defined in this volume, are scattered through a vast area, stretching roughly 4,000 miles from north to south and 6,000 miles from east to west at its widest. But while there are about 200 islands in this region their total land area is only about 12,000–13,000 sq. miles, or little more than one two-thousandth of the whole.

Through this region run a number of important shipping routes, connecting New Zealand, Australia and south-east Asia with the

* Other date lines have been shown on maps, but that mentioned here is the one officially recognized internationally. The subject is discussed in an article 'The date line in the Pacific', in *The Geographical Journal*, vol. XV pp. 415–17 (Jan.–June 1900).

western seaboard of America and with the Panama Canal. For New Zealand, especially, these routes are vital, since they provide the quickest means of sea communication with Europe. The main shipping routes through the Eastern Pacific are shown in Fig. 1, with the approximate distances involved. This illustrates how long most of these sea-lanes are between ports of call, and that many of the islands are not touched by any major shipping route. Conversely, it shows the nodal position of the few principal ports used by overseas vessels, and gives a clue to the relative importance of Honolulu, Papeete, Apia and Pango Pango in Pacific commerce and strategy. (Suva, lying in the Western Pacific, is excluded from consideration here.)

Before the war, air traffic in the Eastern Pacific was comparatively undeveloped. Apart from communication between the United States and Hawaii, the only regular air service was that recently established by Pan-American Airways, which, after trial of several possibilities, settled finally on Canton island as the intermediate stopping-place en route from Honolulu to Noumea and New Zealand.

Diversity of the Island Groups

While the Eastern Pacific area is thus predominantly an oceanic one, the islands themselves are of diverse geographical character. For the most part they are tropical in environment, but included among them are islands such as the majority of the Hawaiian Leeward group, to the north; or Juan Fernández, Easter island, Pitcairn and Rapa, to the south. Lying outside the tropics, these show distinctive features of climate and vegetation. Again, the region includes islands such as the Galápagos and Cocos, with strong American affinities which mark them off from the great mass of islands more towards the centre of the Pacific Ocean. And even within this last great area there are strong contrasts. The popular mental picture of a Pacific island rests largely on ideas of coral reefs, sandy beaches, coconut palms, streams, and luxuriant forest with abundance of fruit. Such islands indeed are numerous. But there also are islands such as the Marquesas, with high-cliffed shores, practically no coral, and few beaches; islands such as the Tokelau group or the Tuamotu archipelago, where coconuts are abundant, but streams do not exist, all fresh water is scarce, and tropical fruits and vegetables will hardly grow at all; islands such as Howland, Baker and Jarvis, in the central equatorial region, where conditions are so arid that all vegetation is stunted and even the coconut palm will not thrive.

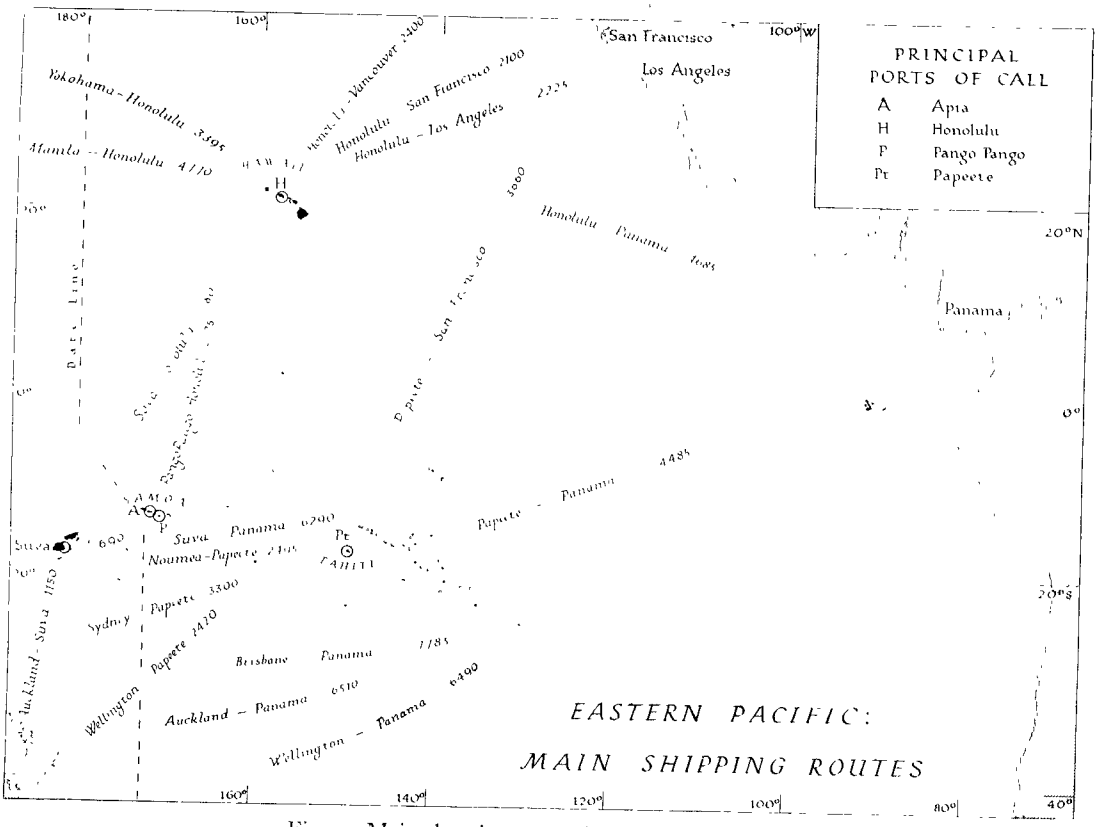


Fig. 1. Main shipping routes in the Eastern Pacific

Distances are approximate, in nautical miles; American coastal routes are omitted. Based on National Geographic Society 1:35 M Map of the Pacific Ocean, 1936, with modifications from commercial sources.

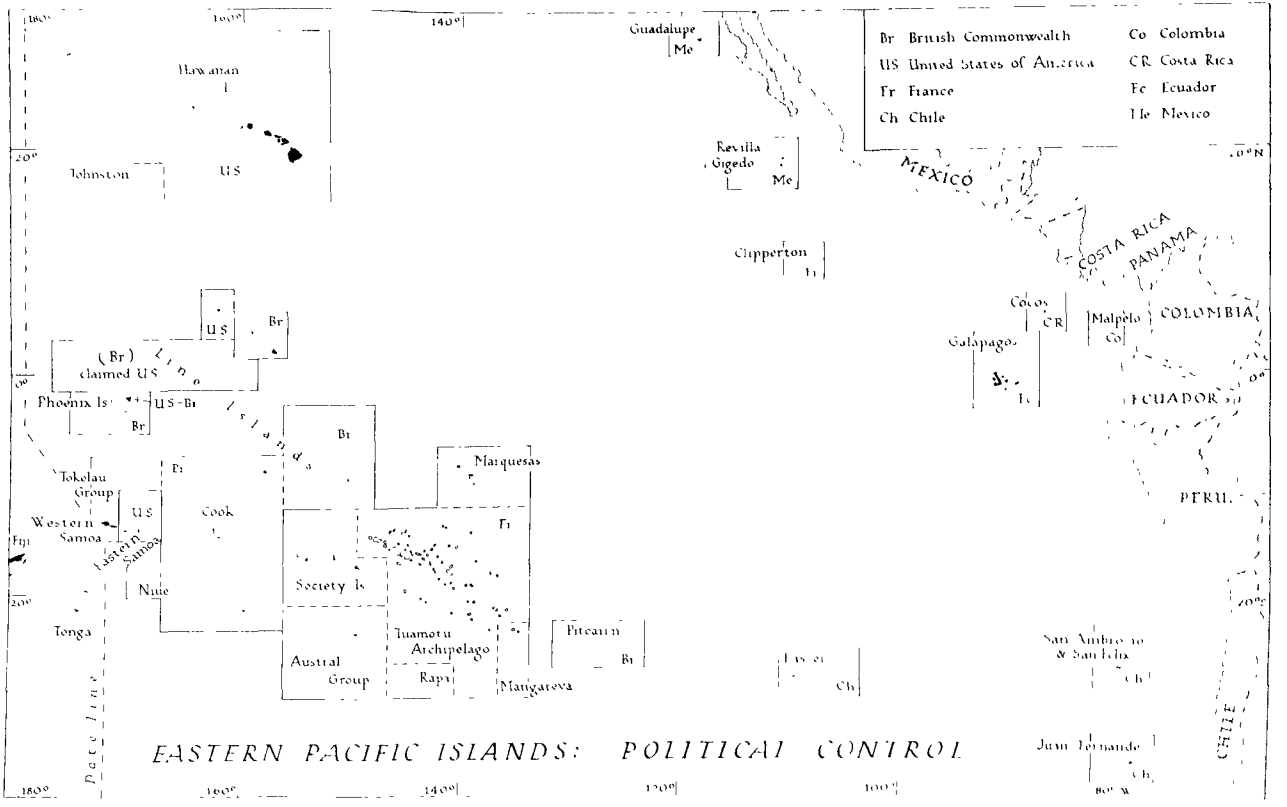


Fig. 2. Political control of the Eastern Pacific islands

The rectangles have been used to separate the various groups, and have no relation to extent of sovereignty. The open rings in the Tuamotu archipelago indicate major atolls.

The major features of the islands of the Eastern Pacific are determined by their physical structure. On the one hand there are the high islands, primarily of volcanic origin (some of them still having active volcanoes); on the other hand there are the low islands, primarily of coral formation. Each type has its own characteristics of climate, water supply, soil and vegetation, and offers different sets of problems for human adaptation.

On the human side, there is a great measure of uniformity in one direction, a great diversity in others. The uniformity exists in the culture of the native people who inhabited practically all the islands (except those close to the American coast) before the advent of Europeans. The Eastern Pacific is the home of the Polynesians, attractive intelligent brown-skinned people who still play a major role in the life of most of the islands. Only in Hawaii, with its complex Occidental and Oriental population, have the native people become submerged beneath the flood of Western technical and social development; and even here they are still a factor in the general situation. Elsewhere civilization has affected them, often deeply, but Europeans, Americans and Asiatics have not been able to establish such a thoroughgoing industrial and commercial change. The Polynesian cultural area embraces not only the region covered in this volume, but also Tonga, the Ellice islands, Uvea and Futuna, Rotuma, and a few isolated small islands farther to the west. These islands, however, are more conveniently dealt with in vol. III.

The diversity of the Eastern Pacific islands is to be seen in the economic and particularly in the administrative spheres. Hawaii, with its huge sugar and pineapple plantations, its well-developed system of communications, its great modern city and port of Honolulu, stands apart from the rest of the Eastern Pacific. Though in many ways its characteristics have still an 'island' imprint, economically and socially it is in quite a different category from the other most important centres. Beside Honolulu, the town of Papeete, the capital of Tahiti and of all French Oceania, is insignificant, while Apia and Pango Pango, the chief townships in Samoa, are little more than villages. And everywhere, with the exception of Hawaii and the phosphate island of Makatea, small-scale agricultural production, primarily by the native people themselves, is the main economic activity of a commercial nature.

In the administrative sphere the position is extremely complex (Fig. 2). National sovereignty is exercised in the Eastern Pacific islands by eight Powers. Mexico controls Guadalupe and Revilla

Gigedo islands; Ecuador, the Galápagos; Costa Rica, Cocos; Colombia, Malpelo; Chile, Juan Fernández and Easter island; France, the Society, Marquesas, Tuamotu and Austral groups; the United States, Hawaii, Eastern Samoa and some small but strategically important islands north of the equator; Britain, Pitcairn, the Cook islands, the Tokelau group, Niue, and most of the Phoenix and other small islands in the central equatorial region. In addition, the United States and Britain exercise joint jurisdiction over Canton and Enderbury islands because of their potential value as air bases, and Western Samoa is held as a mandate from the League of Nations.

But, even apart from political sovereignty, the grouping is still more complicated by administrative arrangements. All French Oceania is governed from Tahiti. But while the Territory of Hawaii for nearly all practical purposes is almost equivalent to a State of the Union, Eastern Samoa is under the administration of the Navy Department of the United States, as also is Johnston island, which is technically within the incorporated city limits of Honolulu. In the British sphere, the Phoenix and the Line islands, as part of the Gilbert and Ellice Colony, are administered by the High Commissioner for the Western Pacific, from Fiji, as are Pitcairn and its neighbours, by a different arrangement. But the Cook islands, the Tokelau group, and Niue are dependencies of New Zealand, and Western Samoa is held by New Zealand as a mandated territory.

From this it will be clear that in describing the islands of the Eastern Pacific no simple logical arrangement can be found which will satisfy at once a division along geographical, cultural and political lines. A political treatment does violence to geography and culture—on these latter grounds, Eastern and Western Samoa, for instance, are part of one unit. A cultural treatment is made difficult if only by the 'melting pot' of Hawaii and the varying strength of the European and Asiatic elements in other island groups where Polynesian peoples are still numerically dominant. A geographical treatment is hampered by the fact that from the economic and social point of view the statistics for different islands or groups, as in French Oceania or the Cook islands, are issued *en bloc*, making it often impossible to separate the financial and commercial characteristics of units of widely varying type.

Plan of this Volume

The general plan adopted in this volume is to follow a broad geographical treatment, taking large groups of islands, or islands in the

same general geographical region, as a unit, in a chapter. But, where possible, the chapter is made also to cover a political unit, thus allowing a general account of administration, finance and trade to be given along with the structure and other physical features of the unit. It has been found most convenient to treat these major units approximately in order from east to west, moving across the Pacific. This general arrangement, shown in the Table of Contents, is somewhat arbitrary. But it gives greater coherence for following the treatment on a map than would a division of the material on purely political lines.

For convenience a general account is first given of each group of islands—or each collection of groups if they form a political unit. The individual islands of each group or region are then considered, the information being arranged as far as possible under the same headings or in the same order. Where information is scanty, or so general as to be more appropriate to the treatment of the group as a whole, this scheme has been modified.

The special nature of the Pacific islands as a region brings into prominence such questions as means of access to the islands and living conditions upon them. Particular attention has therefore been given to passes, anchorages and landings, water supply, food resources and the way of life of the native people. In all cases, unless otherwise specified, this information relates to the period between about 1935 and 1939—more exact dates are often impossible to obtain. Where necessary, specific reference has been made to changes since 1939, and a general summary of conditions in the region since the outbreak of war is given in Appendix III. For the larger islands, some account is given of the ancient culture of the people, since however much it may have been overlaid by civilization, elements of it usually persist in the present-day life. A knowledge of their past, and an interest in it, are often useful to the visitor in establishing confidence with the older and more responsible men of an island community.

Sources of Information

The variety, scattered nature and often isolated position of the Eastern Pacific islands necessarily means that very little is still known about many of them, and that the literature concerning them is distributed through a wide range of sources. For this reason the bibliographies at the end of each chapter are given rather fully.

A brief note on the most general sources may be given here. The

most useful reference work on the Eastern Pacific islands as a whole is the *Pacific Islands Year-Book* (of which the 1942 (Wartime) edition has recently been published). But the treatment is often brief, and is not necessarily always accurate in detail. For coasts the basic authorities are the Admiralty *Sailing Directions*; these, the United States Hydrographic Office *Sailing Directions* and the French *Instructions Nautiques* correspond closely, having drawn heavily upon one another. For other types of information an invaluable source is the long series of publications of the Bernice Pauahi Bishop Museum at Honolulu, an institution which has come to be the primary centre of scientific research for the Eastern Pacific. Its many expeditions by anthropologists, geologists, botanists, entomologists and others have done much to clarify and enlarge the knowledge of the islands, even in fields beyond their primary object of inquiry. To this work certain British expeditions have also contributed much—notably the *St George* expedition, 1924–5.

Maps

No adequate atlas of the Pacific islands has yet been published, and cartographic knowledge of the area is still very imperfect. Most of the interior of the high islands has not yet been properly surveyed, and parts of even such well-known islands as Tahiti have not yet been fully explored. In the central equatorial islands recent air surveys have shown significant differences in the coastline from the outlines given on the ordinary charts, and extension of such surveys in such areas as the Tuamotu archipelago might be expected to clarify the cartographic position considerably (see Appendix 1).

The maps in this volume, therefore, vary in their degree of accuracy. Some, as for instance that of Makatea, or those of the interiors of the Marquesan islands, are little more than sketch plans, indicating the general nature of the country in as precise a manner as the available information allows. The need for even such general maps can be seen by reference to the French charts of the Marquesas, where a finely delineated coastline is backed by a series of virtually blank spaces, with no more than an occasional spot height or ridge trend indicated. The varied sources from which most of the maps have been compiled often differ considerably from one another in details. Normally the coastal outline on each map has been taken from the Admiralty charts, or from United States or French charts when the Admiralty charts are not on a sufficiently large scale. Details of

physical structure, relief, settlement, communications, place names, etc., have been drawn from other official sources and scientific publications.

Latitude and longitude have been taken from Admiralty charts and *Sailing Directions*; in some cases these are only approximate, since precise observations have not been made. Reference to the *Sailing Directions* will show that some islands are reported as being several miles out of their charted position. Altitudes also cannot always be taken as exact; sources of apparently equal authority are apt to show discrepancies, and since many of the altitudes have been calculated from observations at sea they probably include the height of the vegetation. Except on a few specialized maps and diagrams, the original sources of which did not allow of conversion into convenient even units, British units are used throughout the volume. Unless otherwise specified, heights are given in feet, depths in fathoms, distances on land in statute miles, and distances along the coast or from one island to another in nautical miles. For uniformity in the treatment of maps, all scales are given in both statute miles and kilometres (or component units of these).

For the commoner physical and social features on the maps a series of conventional symbols has been used. The general key to these symbols is given in Fig. 3. When on port plans and other specialized maps different symbols are used, an individual key is provided. Mercator's projection has been used in all cases except where otherwise noted.

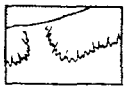
Place-names

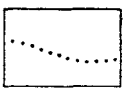
The treatment of place-names in the Eastern Pacific presents great difficulties, and no uniform system exists. The main principles adopted in this volume may be summarized as follows:

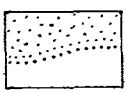
1. Where native Polynesian names are in common use, they are retained; this is the general official practice. Where there is no native name, the official name applied by the country administering the territory is used. Exception is made for a few conventional place-names in English.

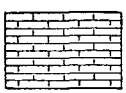
2. Since the same basic Polynesian name is often applied to a feature such as a bay or river, and to a village near by, names of all physical features are given on the maps in italic lettering, and names of settlements in roman lettering.

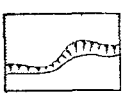
3. Physical features are described in the form of the native name


Coral reef, in general dry or awash at low water

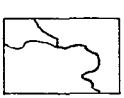

Sunken coral reef, not awash at low water

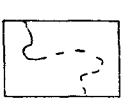

Sand, shingle; usually partly dry at low water

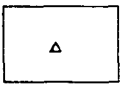

Elevated coral reef (on physical maps)


Cliffs

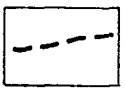

Lake (not shaded when surrounding land stippled)


River, stream

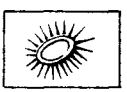

Stream of intermittent flow

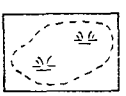


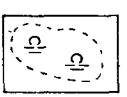
Peak; spot height

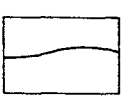

Main ridge trend; watershed

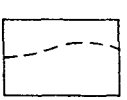

Volcanic crater (on physical maps)

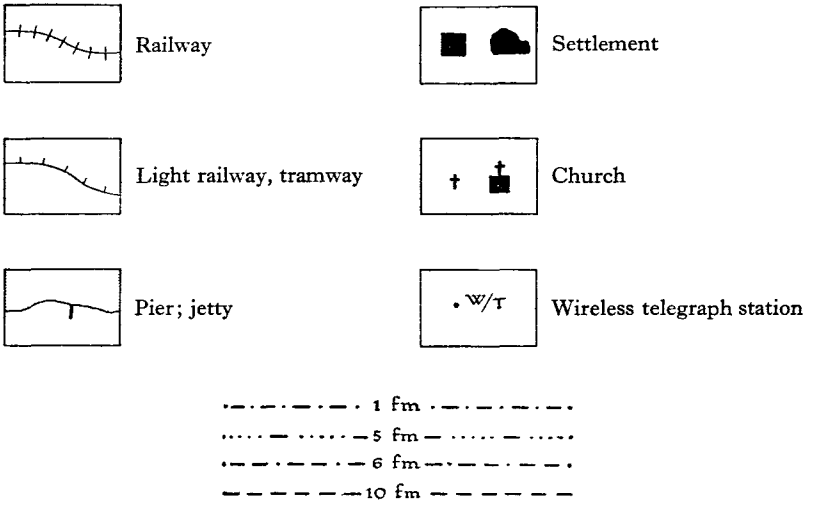

Volcanic crater (on more detailed relief maps)


Marsh


Mangroves


Road


Track; path



Fathom lines (datum as source charts)

Only a small proportion of coral reefs (including sunken reefs) are shown, namely those of major importance to navigation, or to a presentation of the structure of islands.

Fig. 3. Key to general symbols used on maps

with the English descriptive term added. But on maps English descriptive terms or abbreviations have often been omitted for convenience or where the English term is a reduplication of part of the native name and the application of the name is clear.

4. The system of orthography followed is that of the Permanent Committee on Geographical Names, the R.G.S. II System. Exception is made in the case of the glottal closure, represented as ' (inverted comma), for which no allowance is made in the Pacific island lists of names issued by the Committee. The glottal closure is reproduced in place-names in this volume when it is current in the written system of the area concerned (as in Samoa) but not when the written system does not normally use it (as in Tahiti).

5. In spelling, the forms given in the Lists of Oceanic Names issued by the Permanent Committee on Geographical Names have been generally adopted, with some modifications from the publications of the Bernice P. Bishop Museum of Honolulu, and other scientific sources.

(Further details are given in Appendix II.)

Chapter II

THE OUTLYING ISLANDS

(EAST OF LONG. 130° W)

Guadalupe: Revilla Gigedo: Clipperton: Cocos: Malpelo: Galápagos: San Felix and San Ambrosio: Juan Fernández: Easter island: Sala y Gomez: Pitcairn: Oeno: Henderson: Ducie: Bibliographical Note

The islands of the Pacific east of long. 130° W comprise a few isolated islands or groups marginal to Polynesia, such as Pitcairn, Henderson, Oeno, Ducie and Easter island; or marginal to the American coast, such as the Galápagos, Juan Fernández, Cocos, Clipperton, etc. In spite of their scattered distribution and differences in character, it is convenient to treat them in one chapter since they all have small populations or are uninhabited, and are of little commercial importance.

GUADALUPE

Guadalupe (lat. 29° 11′ N, long. 118° 17′ W), which is a Mexican possession, is 20 miles long and lies 140 miles off the coast of Baja California.

Physical Geography

Guadalupe is a mountainous island of volcanic origin with its highest point, about 4,000 ft., near the northern end; here are some relatively fertile valleys, but the southern part of the island is quite barren. The west side is almost perpendicular, while the east side has a more gradual slope. The surface is very rugged and bold cliffs of lava surround most of the island.

The best anchorage is in Melpomene cove at the south end, where there are depths of 9 fathoms and a landing near the western end of the cove. Other landings are near the north-eastern end of the island, where there are two small beaches.

The upper part of the island is enveloped in fog for the greater part of the year. There is a spring in the mountains near the north-eastern anchorage. The water is somewhat brackish, but could probably be used for drinking in an emergency.

Flora and Fauna. There is little vegetation in the lower southern part of the island, but on the mountains of the north an oak, pine and cypress, all peculiar to the island, are found. The only other trees are palms which occur in one gorge. The growth of seedlings of these trees is prevented by the depredations of goats, so that all four types will in time become extinct unless steps are taken to enable them to regenerate.

The Guadalupe elephant seal, which grows to an enormous size, is now protected by the Mexican government, which has made the island a game reserve and prohibits all unauthorized landing. The herd, reduced by hunters in search of oil from countless thousands to a few hundreds, is now increasing slightly and numbers about 1,000. Goats, introduced some years ago, have increased to about 60,000 and eat everything they can reach. Thousands die of starvation annually. Cats have also been introduced and now number about 50,000. They have destroyed most of the birds. A few cormorants, pelicans and rock-wrens which nest out of their reach are all that remain.

Inhabitants

There is a garrison of about twenty-five men with an equal number of women who live in barracks near the north-eastern anchorage. Their chief function is to protect the elephant seals. Only visitors with proper permits are allowed to land. Mexican coast-guard vessels visit the island occasionally.

REVILLA GIGEDO

This group of three islands and a large rock, all of volcanic origin, lies between lat. 18° 29′ and 19° 20′ N, long. 110° 45′ and 114° 50′ W, about 350 miles from the Mexican coast. They appear barren and mountainous from the sea, with few beaches and no good anchorages.

They are Mexican possessions and are uninhabited. There are no meteorological data from any of them.

Socorro

Socorro, the largest of these islands, with an extreme length of under 10 miles, consists of a single mountain which rises from deep water to a height of 3,707 ft. Volcanic activity persists on a small scale and there are reported to be sulphur deposits on the island.

Braithwaite bay on the south coast is the best anchorage and provides protection from the prevailing wind. Depths of 17 fathoms occur 1,000 yd. from the shore, but the bottom is foul in parts. Cornwallis bay on the south-west coast provides an anchorage off two white coral beaches westward of cape Rule. Grayson's cove in the north-western part of the bay has a small beach and a spring of fresh water. In the north there is an anchorage for small vessels to the east of cape Middleton, where there are sand beaches. Apart from this the coasts are rocky and consist mainly of cliffs.

Flora and Fauna. In the lower country there is a thick, thorny, almost impenetrable growth of bushes and cacti, while the slopes of the mountain are covered with trees of various kinds, which become taller with increasing elevation. The country is cut up by steep narrow ridges and gorges in some of which there is dense and gloomy forest. A tree which produces well-flavoured fruit, dark purple in colour and $\frac{3}{4}$ in. long, is common.

A hundred Australian sheep were landed on the island in 1867 and have since increased to about 10,000. There are also believed to be a few cattle. There are no native mammals but birds are plentiful, and there is one kind of lizard. Mosquitoes were found to be troublesome near the coast by an expedition which visited the island in May 1925.

Clarion

Clarion is about half as long as Socorro and lies 214 miles westward of it.

The land rises very steeply from the north coast to a height of between 200 and 1,000 ft., and then slopes more gradually to a low and comparatively level area on the south side. The coasts consist of steeply sloping rocks except in the neighbourhood of Sulphur bay, where there is a beach. Sulphur bay provides a reasonable anchorage in northerly winds; there are depths of 12 or 13 fathoms about 300 yd. from the beach.

Over most of the island there is a deep reddish brown soil which is well covered with low vegetation. There is no permanent water. The dense thorny scrub extends from the coast to the highest point and makes progress inland difficult. There are no mammals on the island, though a considerable variety of birds occur and there is one species of lizard and one of harmless snake. Insects of many kinds occur and mosquitoes are sometimes troublesome.

San Benedicto

San Benedicto is a barren rock about 3 miles long lying 32 miles northward of Socorro. It is much broken up by cinder cones and deep ravines and reaches a maximum height of 975 ft. towards the southern end. It is reported that the southern portion shown on the chart has either eroded away or else never existed. There is a landing place near the middle of the east side.

The vegetation consists largely of grass, the commonest kind of which is very tough and wiry and reaches a height of 5 or 6 ft. in places. There is only one bush which is at all common. Sea birds frequent the island and there is a limited insect fauna. There is no permanent fresh water.

Roca Partida

Roca Partida lies 6–7 miles westwards of Socorro. It is 100 yd. long, reaches a height of 110 ft. and has depths of more than 30 fathoms close-to all round. It seems to be impossible to land there.

CLIPPERTON

Clipperton island (lat. 10° 18′ N, long. 109° 13′ W) lies isolated in the Eastern Pacific, about 670 miles south-west of Acapulco on the coast of Mexico. It may have been discovered by the Spaniards, but was named after Captain Clipperton, one of the companions of Dampier, in 1705. The island was formerly claimed by Mexico and by France, but in January 1931 it was adjudged to France by arbitration of the king of Italy.

Clipperton, lying about 200 miles north of the great circle track from Panama to Singapore, has been suggested as a possible coaling station, but the expense of constructing a channel into the lagoon and clearing obstructions would seem to make this idea impracticable. The island has, however, rather greater potentialities as an airfield site and seaplane base. Its importance in this connexion is due to its position in the outpost zone of the Pacific approach to the Panama Canal, from which it is distant 1,735 miles.

Physical Geography (Fig. 4)

Structure. Clipperton is a low atoll of elliptical shape, $2\frac{1}{2}$ miles in greatest diameter. The land rim, ranging from a few yards to $\frac{1}{4}$ mile in width, and generally from 8 to 20 ft. in height, is composed of hard

porous coral conglomerate, partly covered with coral shingle, which on the northern and eastern sides is interspersed with patches of wind-blown sand. On the south-east side of the island is Clipperton rock (*Rocher Clipperton*), an isolated mass of phosphatized trachyte, 62 ft. high, and the most prominent landmark. It looks from a distance like a ship under sail, and from close by like a huge castle (Plate 1). Clipperton is an unusual case of an atoll with an exposed remnant of the volcanic foundation.

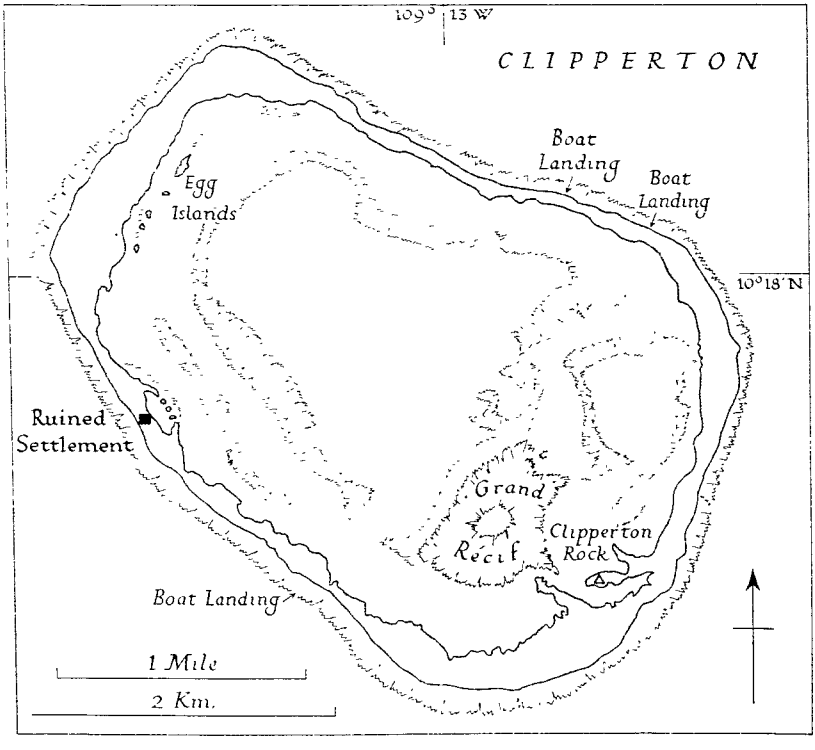


Fig. 4. Clipperton

For general key to symbols see pp. 8, 9. Based on: (1) Admiralty chart no. 1936; (2) G. Grandidier, *Atlas des Colonies Françaises*, carte no. 36 (Paris, 1934); (3) official sources.

Lagoon. The lagoon which occupies the interior of the island is cut off from the sea, and reaches a depth of 55 fathoms. It has numerous coral banks, some awash, the major one being Grand Récif, near the south-east end. At the north-west end are five islets, known as Egg islands (*Iles Egg*), since they are the nesting-place of numerous sea



Plate 1. Clipperton rock

This exposed volcanic rock, 62 ft. high, stands as a prominent landmark in contrast to the flat coral surface of the remainder of the island.



Plate 2. Tagus cove and surroundings, Isabela

Taken from 4,000 ft. The crater in the foreground, open to the sea, is Tagus cove. The smaller enclosed crater near it is about 200 ft. above sea level and the water in it is probably fresh. The large crater in the background is also completely enclosed; the white line at the water's edge is a deposit of salt.



Plate 3. Lava flows on Isabela, 1925

During the eruption the lava flows reached the sea on the west coast and produced clouds of steam. The water inshore is light coloured through having been heated by the molten lava.



Plate 4. Coastal vegetation, Santa Cruz

The tall plants are *Opuntia* (with broad flat branches) and *Cereus* (with cylindrical stems). The majority of the bushes are leafless as the photograph was taken in the *garúa* season, but the vegetation is quite dense.

birds. The quality of the lagoon water would appear to vary with rainfall. It has been described as muddy and stagnant, and as brackish, smelling strongly of ammonia, during the dry season, December to May, when a thick green scum extended out from the edges of the lagoon, and a matting of weed rose from the bottom to near the surface. But a sample of water taken in January 1929 was found to be fresh.

Coast

The coast of the island is fringed by a continuous coral reef, on which the sea breaks heavily and almost continuously. Behind this are beaches of white sand. There are no major indentations in the coastline, and the only prominent feature is Clipperton rock.

Anchorage. Depths of 250 fathoms are found at a distance of half a mile to one mile from the coast all round the island except on the north-west, where the 50-fathom curve lies about 1,300 yd. from the shore. More moderate depths have been accurately charted only off the north-east coast, where the 5-fathom curve lies at a distance of 250 yd., and the 10-fathom curve 350 yd. from the shore.

There is no good anchorage. The most suitable is on the north-east side of the island, in 20–45 fathoms on a shelving coral bottom, with good holding ground, but the prevalence of heavy squalls from east-north-east renders even this unsafe. Large vessels, however, have anchored about a mile off the north-west coast, one in 57 fathoms and another in 75 fathoms of water. Currents in the vicinity of the island are apparently irregular, setting sometimes to the east, sometimes to the west, their strength and duration depending largely on the wind.

Landing. Landing is possible for small boats, if the surf allows, at three sandy beaches, one on the south-west coast, and two on the north-east coast. Each is fronted by coral reef and may involve wading, but at the more easterly of the two on the north-east the reef narrows, and the safest landing is reported to be there. Choice of landing places would seem to depend on the direction of the wind and sea at the time.

Climate

No meteorological records for Clipperton are available, but the climate would seem to be warm and equable, with mean monthly temperatures probably between about 75 and 80° F. The rainy season is from May to October, and the total annual rainfall may amount

to between 40 and 70 in. Light north-easterly winds occur in the drier season; variable winds, calms and squalls in the rainy season.

Water Supply. There is no definite source of fresh water on the island. It is doubtful if the lagoon can be relied upon for drinking purposes, for which rain-water catchment would seem to be necessary. But the presence of pigs on the island indicates that the lagoon water is probably sufficiently fresh for animal use.

Flora and Fauna

Vegetation on Clipperton is very scanty, consisting of low weeds and grasses thinly spread or in patches, with a very few coconut palms growing in clumps or as single trees. There are no bushes.

Frigate birds and other sea birds breed on Egg islands and are numerous on Clipperton rock; their eggs provide a useful source of food. The only mammals reported in 1941 were about a dozen black pigs of poor quality, living apparently off the grass. Small fish are common in the lagoon, and fish, sharks and crayfish are abundant in the waters surrounding the island.

History and Administration

The history of Clipperton is slight, but has some elements of drama. For long after its discovery it lay neglected, but in 1858 it was claimed by France after Lt. Coët de Kerguelen in the frigate *Amiral* hoisted the colours of Napoleon III there. Mexico, basing her claim on succession to such Spanish interest as might have been created by an early Spanish discovery, protested, but took no action. The official Mexican name given to the island was *Isla de la Pasion.* In 1896 another French naval vessel called, but in 1897 the Mexican gunboat *Democrita* hoisted the Mexican flag there. France apparently made no protest against this at the time. In 1906 phosphate deposits (see below) were discovered on the island, and a few labourers began to work there. Mexico installed a small garrison. The controversy thus created with France was referred to the International Court at The Hague, but the court refused to adjudicate. In 1909 Porfirio Diaz, President of Mexico, asked King Victor Emmanuel of Italy to arbitrate in the dispute, but his decision in favour of France was given only in 1931. Meanwhile Mexico had continued to maintain her garrison, which was reported by U.S.S. *Cleveland* in June 1914 to be thriving. Till then supply ships from Mexico had been calling every four months, but after this time they ceased, and the garrison, consisting with troops and their families of thirty people all told, was left

without relief. Their leader and three other men put off with few supplies in a rowboat in an attempt to reach the mainland, but they were never heard of again, and most of the remainder died from scurvy and starvation. The survivors lived mainly off coconuts and fish, till in July 1917 U.S.S. *Yorktown* called and removed the three women and eight children who were left. The phosphate workers had apparently been taken off before the abandonment of the garrison.

The island has since remained uninhabited. In 1941 there existed merely remnants of a settlement on the west side, with rusted machinery and an unusable narrow-gauge tramway running out on to the reef.

For administrative purposes Clipperton was formerly included by France among the dependencies of New Caledonia, but in 1936 it was put by Presidential decree under the jurisdiction of the governor of the French Establishments in Oceania.

Economics

The only economic importance of Clipperton has lain in its phosphate, of which there was formerly a moderate quantity. One analysis has given 78 % of tribasic calcium phosphate, and the quality in general is stated to vary between 65 and 80 %. The concession was held by a British firm, but was worked only intermittently because of weather and difficulties in landing. An export of 200 tons per annum has been reported, but it seems probable that the deposits have now been virtually exhausted.

Communications

Clipperton island is not on any shipping route, and there is no sea communication with it apart from occasional visits of vessels, probably mainly fishing craft.

There was no air communication with the island at the outbreak of the present war. It has potentialities as an airfield site and seaplane base, though much dredging would be required to produce the latter; to maintain sea-borne supplies there would be difficult.

COCOS

Cocos island (lat. 5° 33′ N, long. 87° 00′ W) with the islets off its coasts, lies about 300 miles south-west of the nearest point on the Costa Rican coast and about 540 miles from Panama. It is about 4 miles across and is a possession of Costa Rica (Fig. 5).

Physical Geography

The island is of volcanic origin with two main cones, the altitude of the higher of which is variously given as 1,700 and 2,788 ft. In most places there are cliffs up to about 600 ft. high, dropping more or less perpendicularly to the sea; they show that the island is composed chiefly of massive lava flows. The offshore slopes are very steep, depths of 30 fathoms or more being found close to the base of the cliffs in places. A submerged plateau at a depth of between 50 and 70

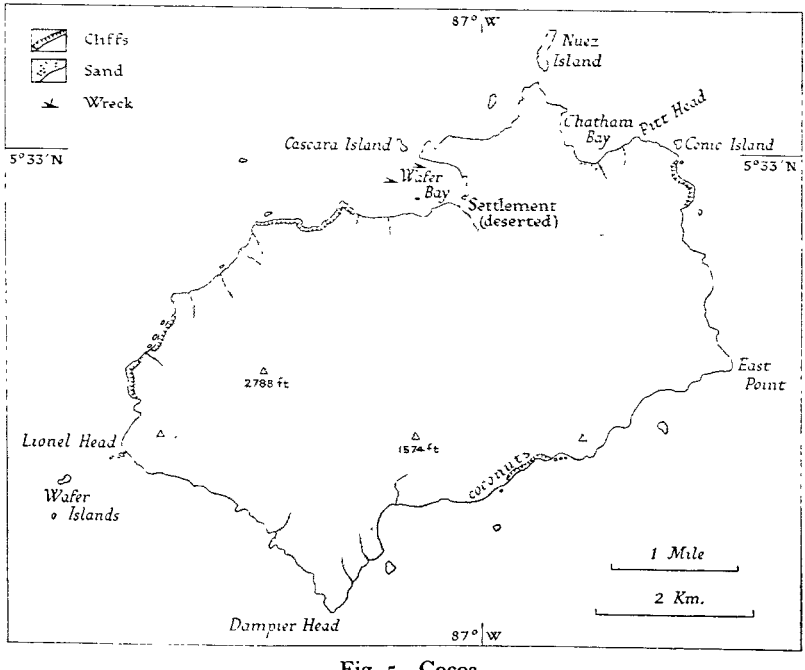


Fig. 5. Cocos

Based on official sources.

fathoms has been proved to exist to a distance of a mile and a half from the shore. The various rocks and islets, which are commonly of sugar-loaf form, rise from this plateau.

It is clear that when the cliffs were being formed the island stood some two or three hundred feet higher above sea level than it does now, but that since then either it has subsided or the sea level has risen, with the result that the lower part of the cliffs is submerged and the lower reaches of the larger river valleys are drowned.

There are numerous streams, the majority of which fall into the sea

from hanging valleys. This happens because the rate of cutting back of the cliffs by the sea has been greater than the rate of deepening of the valleys by the smaller streams. Some of these waterfalls fall into basins hollowed out of an old shore shelf a few feet above the present sea level, leaving the cliff face behind dry. Two rivers in the northern part of the island flow over softer, ashy rocks and have deepened their beds much more rapidly than the others; the mouths of these two have become embayed and form Wafer and Chatham bays.

Lionel Wafer of the *Bachelor's Delight* described in 1684 what appears to be a crater lake on the island, but its existence has not been proved, owing to the difficulty of penetrating the interior.

Coasts and Anchorages. Chatham bay, on the north-east coast, provides the best anchorage, being fairly sheltered and having depths of 7–14 fathoms. There are two beaches. One, near a small stream, is rather exposed, so that landing is made difficult by incessant breakers; the other, to the west of this, has the disadvantage of being cut off by impassable cliffs from all other parts of the bay. Chatham bay is marked by Conic island which lies off Pitt head, the eastern point of the bay.

Wafer bay, on the north-west coast, about a mile to the westward of Chatham bay, is more exposed, has deeper water, and the landing place is worse. Cascara island lies off the north entrance. With the exception of these two bays and Dampier head on the south side of the island, the coasts consist of vertical or nearly vertical cliffs. There are no coral reefs.

Climate. There are no detailed meteorological records, but it is evident that the climate is a warm and wet one. Winds are light southerly from April to October, and variable in other months. The rainfall is said to amount to at least 70 in. a year, probably with two maxima—October to December and April to May. January to March is the driest period. Between 3 and 13 September 1905 there was rain on 8 days; the rain was often very heavy. The temperature appears to range from 75 to 85° F. Small streams are abundant and it is possible to water a vessel, though not with any ease or rapidity.

Soil, Vegetation and Fauna. The soil is for the most part a sticky yellow clay with considerable humus. In exposed places the superficial layer of humus is often washed off leaving the clay bare. Soil erosion is rapid on the steep mountain slopes, and landslides bringing down large quantities of earth and boulders are rather frequent.

The island is largely covered with dense evergreen forest in which there are numerous lianas and orchids and other plants growing upon

the trunks and branches of the trees. Ferns are abundant and conspicuous, though only one kind of tree fern is known to occur.

Coconut palms in small numbers are found here and there near the coast. There are no mangroves, probably owing to the absence of sheltered bays or lagoons suitable for their growth. There seem to be about 100 different kinds of plants on the island compared with nearly 700 in the Galápagos; rather less than 10 % of these are known from nowhere else, while just over 40 % of the Galápagos plants are confined to those islands. The small flora and few peculiar species on Cocos suggest that it is of fairly recent origin and has never been connected with any other land.

There are no native mammals, but pigs which were introduced in 1793 thrive, and introduced rats are numerous. There is a harmless snake and a lizard, while turtles occur in the coastal waters. There are many sea birds and plenty of edible fish.

History and Resources

The island was discovered early in the sixteenth century and was then uninhabited. In the seventeenth century it became a favourite resort of buccaneers and privateers on account of the abundance of good water and sea birds and the absence of inhabitants.

In 1720 three white men and eight negroes from Captain Clipperton's ship, the *Success*, were left there at their own request and were probably the first residents.

At the end of the eighteenth century this island, like others off the Pacific coast of South America, was frequented by whalers and visited by ships of war of various nations.

Captain Colnett in the *Rattler* left goats and pigs and planted fruit and vegetable seeds in 1793. Treasure is reported to have been secreted on the island from time to time. In 1818 or 1819, a notorious pirate, Benito, alias Bennett Graham, is said to have hidden a vast plunder from certain churches in Peru; in 1826, William Thompson, in command of the brig *Mary Read*, concealed more treasure in the form of gold coin, jewels and silver ingots. Since then the history of the island has consisted chiefly of periodic and apparently unsuccessful attempts to recover the treasure.

The island was first definitely claimed by Costa Rica in 1888, and its ownership has not been disputed since. In that year a German or Swiss settler was nominated as governor and settled with his wife and one native labourer at Wafer bay where he remained till 1903. In 1935 there was a small garrison. This supervised the treasure-hunt-

ing parties which were given the exclusive right of search for a limited time by the Costa Rican government on payment of a substantial sum and an undertaking to share the proceeds, if any.

There are no permanent inhabitants. Apart from the huts occupied by the garrison at Wafer bay there is no settlement. In addition to the wild animals mentioned above, guavas, papaya, lemons and pumpkins have been introduced from time to time and are reported to maintain themselves in the neighbourhood of Wafer bay. Except for the difficulty of finding level ground and keeping down the forest growth, most tropical crops might be cultivated.

Communications

A Costa Rican gunboat is said to visit the island at irregular intervals. There is no land suitable for the construction of an airfield.

MALPELO

Malpelo (lat. 3° 59′ N, long. 81° 34′ W) lies 257 miles west-south-west from Cabo Corrientes in Colombia. It is a barren rock probably of volcanic origin, about a mile long and nearly inaccessible. It is a Colombian possession. It, and the small rocks around it, are surrounded by deep water, 1,000 fathoms or more occurring a few miles offshore.

Physical Geography. The sides fall steeply to the sea from the nearly flat top, the highest point of which is 846 ft. There are no harbours, anchorages or beaches. Landings have been effected on the rocks on one or two occasions in completely calm conditions. There are no meteorological observations from the rocks, though from the latitude it is likely that the climate is hot and damp. There is no permanent water. A little scrub is reported to occur in gullies in the cliffs, but apart from this the island, which is frequented by sea birds, is believed to be devoid of vegetation. A single species of lizard has been found on it.

History. Malpelo was one of the first islands to be discovered by voyagers from the Pacific coast of America, being shown on a map of 1530. Towards the end of the eighteenth century a Spanish vessel obtained some water from a pool, which was described as being not overclean. The island is uninhabited. It gets its name from a supposed resemblance to a bald head.

GALÁPAGOS

The Galápagos are a group of islands near the equator, between 600 and 750 miles west of Ecuador, to which they belong. The official name, Archipiélago de Colón, was given to the group in 1892 at the time of the celebration of the 400th anniversary of the discovery of America by Christopher Columbus (Cristóbal Colón). The islands are, however, still known to the inhabitants and to the world in general by their older Spanish name of Galápagos. The individual islands have several names each, but with one exception the official ones of 1892 are used by the inhabitants. For all islands and localities the names in local use are given here.

The group consists of thirteen islands (six of which are considerably larger than the others), nineteen islets and at least forty-seven rocks above high water. They lie between lat. 1° 30′ S and 1° 40′ N, long. 89° and 92° W, and have a land area of between 2,400 and 3,000 sq. miles (Fig. 6).

Physical Geography

Structure and Geology

The islands are all entirely of volcanic origin and are relatively recent. Some still display volcanic activity. The north-western islands are more recent than the south-eastern and have steep mountains, very numerous and obvious craters and much bare lava, particularly at low levels. The older islands, in contrast to this, usually have gentle slopes and rounded hills, the craters often being so broken down by weathering as to be recognizable only to the eye of a geologist. Some of the very small islands consist of single volcanic cones, or the broken down remains of large cones, and rise steeply from the sea to elevations of 100 ft. or more.

Isabela, the largest island, has five principal craters, the highest of which is about 4,500 ft., San Cristóbal and San Salvador have two, and the other islands one each. These volcanoes are all of the same general type, though some of them are much broken down by weathering; many of them are surrounded by numerous parasitic cones. In general they are circular or oval and 15–20 miles across at sea level with craters 3–5 miles across. The newer craters are said to be about 500 ft. deep. In those which have weathered very little the slope in the upper part is about 25° decreasing to 10–15° lower down, while from 500 to 600 ft. up lava fields 3 or 4 miles wide slope gently to the

sea at an angle not usually exceeding 2°. The cones are built mainly of cinders and tuff (fine compressed volcanic dust), the lava generally being superficial and local (Plate 2).

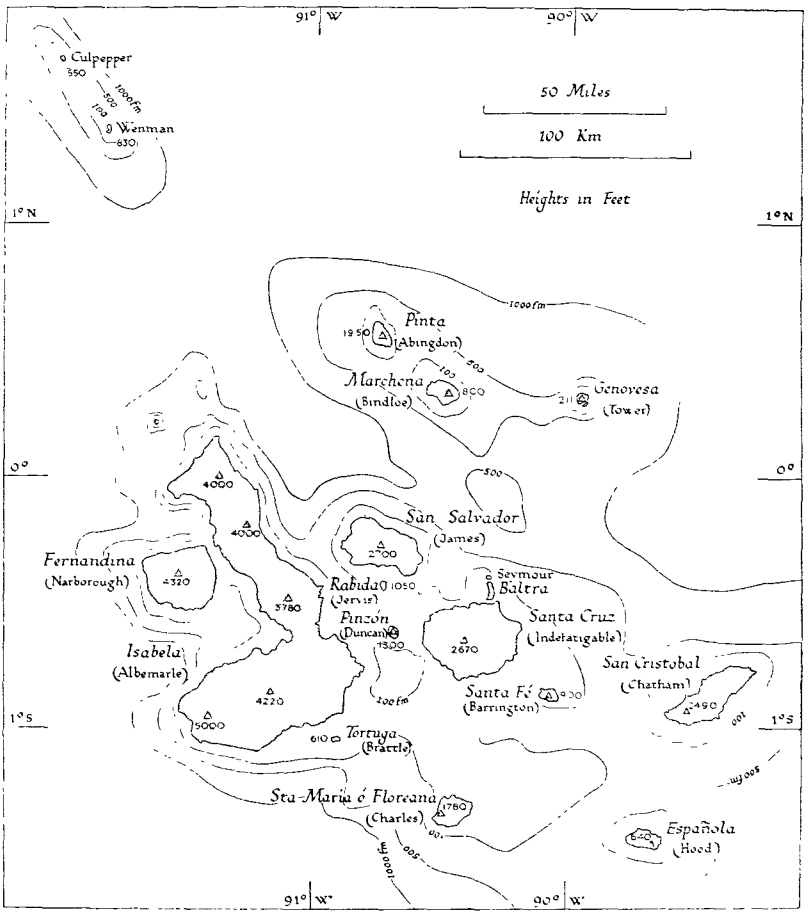


Fig. 6. Galápagos archipelago

Based on American Geographical Society 1 : 1 M Map of Hispanic America, 1927.

There appear to have been three phases of volcanic activity. During the first the main volcanoes were built up; this was followed by a great development of parasitic cones which was probably caused by the blocking of the main vents. The third phase, which continues to-day in some of the islands, is the eruption of lava through fissures;

this gives rise to the comparatively level and often nearly bare coastal lava fields.

An eruption of this kind was witnessed south of cape Berkeley on Isabela in 1925. It began on 11 April, and 9 weeks later the lava flow had reached the sea and was pouring over 100 ft. cliffs, producing explosions and clouds of steam (Plate 3). The water near the coast was heated considerably, and many fish, sea lions and birds were killed.

Both Fernandina and Isabela were active again in 1938. An eruption was seen on San Salvador in 1899. Floreana is not known to have been active since 1813.

The smaller islands, for instance Pinzón and Rabida, are tuff volcanoes which have not passed through the later stages and so have neither parasitic cones nor lava fields. The cone which undoubtedly once existed on Marchena has disappeared and its site is now a caldera (wide volcanic depression) with small tuff cones both inside and outside it. The majority of the islets are parasitic cones rising from the submarine portions of the major volcanoes. Wenman and Culpepper are so far from the other islands that they must represent the summits of two independent volcanoes rising from deep water.

Water Supply

There are hardly any permanent streams, as the rainfall is seasonal and variable, the soil generally scanty, and the rocks porous and full of fissures. Crater lakes exist on some islands, for example, San Cristóbal, Isabela and Genovesa. Salt pools, and more rarely brackish ones, occur near the coast on several islands.

Coasts

The coasts consist typically of gently sloping lava fronted by narrow beaches of black boulders, sometimes of low cliffs with sandy beaches and small mangrove swamps, while in some places there are steep high cliffs. Small patches of coral occur in a few places, but there are no real reefs. Good anchorages are to be found off most of the larger islands except Fernandina, the most used being Puerto Chico and Puerto Grande (San Cristóbal), Post Office bay (Floreana) and Academy bay (Santa Cruz).

Climate

The Galápagos are in normal years just south of the line where cold water, flowing north and then west as the Peru or Humboldt current, meets the warm surface drift from the open Pacific. The temperature

of the sea surrounding the islands is thus rather below the temperature of the land here, while in most tropical regions the sea is as warm as or even slightly warmer than the land. This fact has a very important influence on the climate. The land is cooled by the surrounding sea and the temperatures are therefore not unduly high for equatorial regions; rain in the low country falls only during a short time, usually from January to March, but cloud, known locally as the *garúa*, hangs about the high ground for the rest of the year.

Seasons. Typical sea temperatures and currents during the *garúa* season are shown in Fig. 7; at this time of year the 26° C. (78·8° F.) isotherm lies well north of the islands, and winds blowing over them are warmed rather than cooled at low altitudes, consequently there is no rain. On the high ground, however, the winds are cooled sufficiently to produce cloud and fog, though no substantial amount of rain falls. In the rainy season, which sometimes extends from December to June, though it is usually much shorter, and rarely fails altogether, the sea temperature is higher, and the 26° isotherm is only just to the north of the main islands (Fig. 8). This seasonal change is due to the shift of the equatorial low-pressure belt. In exceptional years such as 1891 and 1925 the 26° C. isotherm ran well to the south of the islands which were then surrounded by warm water (Fig. 9). Conditions then approximated closely to those normal in the tropics, and exceptionally heavy rain fell. The same conditions usually bring rain to the desert coasts of Peru and sometimes even north Chile. These exceptional years are called '*Niño* years', as the phenomenon was supposed to be due to a warm current, the *Niño* current, from the Gulf of Panama. It is now known to be due to a surface drift of Pacific water inshore which is sufficiently powerful to displace the cold Humboldt (Peru) current.

Winds. During the *garúa* season the south-east trade blows regularly, but during the rainy season there are long calms with light day breezes and occasional squalls.

Temperature and Humidity. There are few exact figures for temperature. On San Cristóbal from August to November the temperature varies between 68 and 72° F., and at the end of November, when the *garúa* disappears, the temperature rises somewhat. The following records were made at Academy bay, Santa Cruz, during February and March 1939:

	Mean max.	Mean min.	Mean	Highest	Lowest
February	82·5	69·3	75·9	87	65
March	84·6	70·1	77·3	88	67

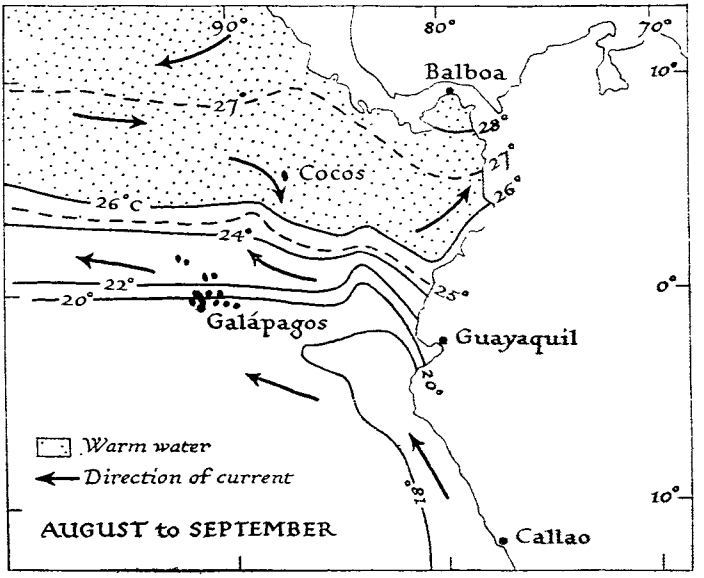


Fig. 7. Currents and sea temperatures, *garúa* season

Based on R. C. Murphy, *Oceanic Birds of South America*, vol. 1, p. 104 (New York, 1936).

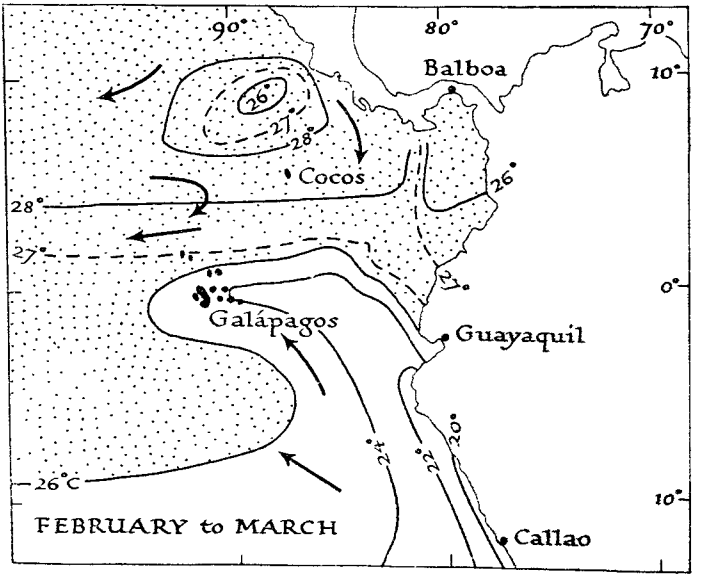


Fig. 8. Currents and sea temperatures, rainy season

For key see Fig. 7. Based on R. C. Murphy, *Oceanic Birds of South America*, vol. 1, p. 105 (New York, 1936).

This is the hottest time of year, July to September being the coldest. On most nights the air temperature fell below the dew-point, the humidity during the day being high, and there was rain on 12 days between 2 and 19 February, but none from 20 February to 1 April. There was thunder on 15 February. During this period the wind was south-east on 36 days, south-west on 9, west on 1 and calm on 9 days. The south-east wind was a local day breeze which blew from 0700 hrs. to 1700 hrs. There are no records of rainfall measurements.

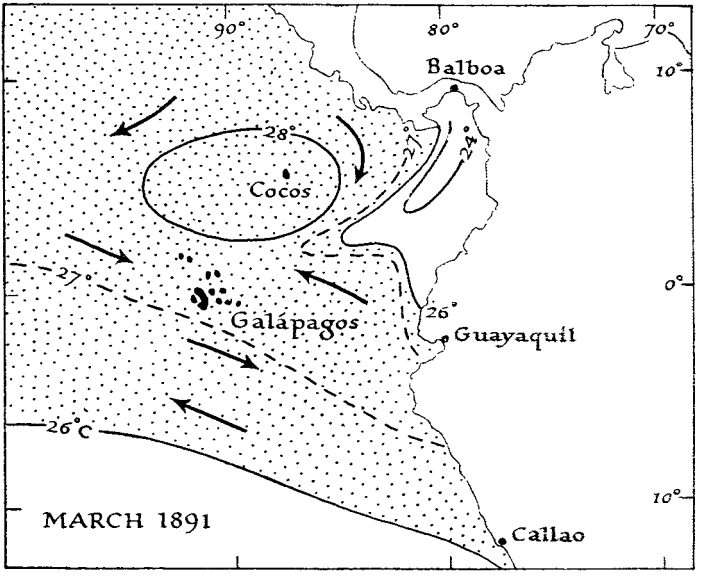


Fig. 9. Currents and sea temperatures in a *niño* year

For key see Fig. 7. Based on R. C. Murphy, *Oceanic Birds of South America* vol. 1, p. 107 (New York, 1936).

Soil

Soil is much more abundant on the older islands, where weathering processes have been going on for a longer time, than on the more recent islands in the north-western part of the group.

On the smaller lower islands and in the low coastal districts of the larger islands there is little soil as the rainfall is small; at higher altitudes, and particularly in the *garúa* region, there is on the large islands a fair amount of fertile soil, though the depth is nowhere great. It varies in colour from yellow to red, or, in the humid forest,

to black owing to the considerable quantity of humus formed by the decay of leaves.

All the soils are produced by the weathering of lava, tuff and other volcanic rocks, the varying composition of the original material being largely responsible for the differences between the soils of different localities.

Vegetation

Lowlying regions. Locally, particularly where there are sheltered lagoons, the shores are fringed with mangroves, sometimes growing as a thin line, and sometimes forming a dense and impenetrable mass. But more typically the semi-desert vegetation comes right down to the shore (Plate 4).

The vegetation of the coastal and lowlying areas generally consists chiefly of thorn scrub, the trees varying in height from about 6 to 30 ft. Outside the rainy season the whole presents a dreary grey appearance, but for a short period during the heavy rains the landscape becomes bright green, the thorns come into full leaf, and many small annuals spring up all over the ground. At this season the islands have a deceptively fertile appearance. The rains fall earlier in the season the greater the elevation, so that the green belt gradually moves outwards from the central high land towards the coast with the onset of the rainy season.

The vegetation of the coastal areas of the high ground is of very variable height and thickness. In general, it is thicker and taller on the south and west side than on the north and east, owing to the greater rainfall. Where there have been recent upwellings of lava, a few stunted thorn trees, chiefly acacia or prickly pear, may be all that is present. But in older parts there is often found a dense tangle of bushes and trees, many of them thorny, and growing so closely that it is impossible to get through even with a machete. This tangle is often thickest a short way in from the beach. Farther inland the trees become taller and bushes get scarcer, so that progress is usually easier. On islands such as Baltra (South Seymour) and Española, there are large areas of open 'parkland' where progress is extremely easy, but this is due to the activities of the introduced goats. Except on the islands where there are goats, or where there has been much recent volcanic activity, it is advisable to carry a machete when away from the few trails.

The most striking tree in the coastal belt is the prickly pear (*Opuntia*). This genus is widespread in tropical regions but grows

as a tall tree nowhere else in the world. In some islands there are species which grow to about 30 ft. with branches at intervals all the way up, while in other parts there are species 6–10 ft. high with a spreading head of branches. All the species are found nowhere else. The spines are painful but can usually be avoided, as *Opuntia* is characteristic of the more open ground, and grows as isolated trees, not as dense thickets. For this reason when walking in the coastal region it pays to make for regions where *Opuntia* can be seen.

There is one other kind of cactus with cylindrical branching stems growing upwards for some 30 ft. The rest of the coastal vegetation consists of bushes and small trees of many sorts. Many, such as the acacias, are thorny. Others, such as *Bursera* and *Croton*, are not. Few trees give any shade except a large mangrove, usually growing close to the shore, but this is scarce. There is also a dense non-thorny bush (*Maytenus*), with small oval leaves.

One other large tree, the manzanilla (*Hippomane Manzanilla*), must be mentioned. This grows singly or in small groups chiefly near the shore, but also for several miles inland, and bears fruits like very small hard green apples (brown when fallen to the ground) which are poisonous. Furthermore, when cut or bruised (and it requires little to do this), there exudes from the stem a milky white juice which can raise blisters on the skin. This tree is best avoided.

On the islands which lack high ground, the whole vegetation is of the above-mentioned types, and local variations are due to several factors: the aspect (whether facing south-west or north-east, etc.), whether the island lies in the rain shadow of a larger island, how recently the last volcanic activity took place, and whether goats have been introduced. There are variations in the flora of the individual islands, but these are conspicuous only to a botanist.

Higher Ground. Except during the rainy season, no rain falls on the lowlying areas. The upper regions, in addition to receiving more rain during the rainy season, are usually covered in mist (*garúa*) outside the rainy season. In these regions humid forest is developed and higher still there is open country.

The change-over from the barren semi-desert of the coastal areas to the humid forest at about 800 ft. is not sudden, but takes place very gradually over a long transition belt. Indeed, most of the land surface of the larger islands is covered with vegetation at some stage of this transition phase. Here the characteristic coastal plants gradually become scarcer, the trees become rather taller, and are frequently covered with large tufts of the grey lichen (orchilla), the undergrowth

is much less dense, there is some soil (so that progress is in most parts fairly easy), and the characteristic humid forest trees appear.

Humid forest is best developed on Santa Cruz, occurs also on San Salvador and less on Pinta, while on Isabela, San Cristóbal and Floreana, it has been modified or almost destroyed by human activities.

In the humid forest of Santa Cruz there are tall trees, among which *Scalesia* is prominent. This belongs to the Compositae (daisy family) and has a hollow stem, so that the settlers do not fell it for wood, and as a result it is now unnaturally prominent. *Psidium* is another common tree, which is felled. Bushes are scarce in most parts so that progress is normally easy over the rich black soil. The trees often have orchids, ferns, mosses, lichens, club mosses and other plants growing on them, this growth getting richer with increasing altitude until the tree limit is reached.

As one progresses higher, the trees get smaller again, and one meets a dense growth of tree ferns, various kinds of bushes and bracken. Here the growth is so dense that progress is almost impossible except where proper trails have been cleared. The vegetation is usually very wet and dripping and trees disappear altogether, but bushes, particularly an evergreen shrub, *Miconia Robinsoniana*, still form dense thickets, between which there are areas of bracken and grass. Finally, one emerges on to irregular open country, in which bracken is common with much grass, ferns, patches of club mosses and liverworts. Progress is easy in most parts, and nowhere harder than in bracken in England.

The only other islands high enough to have open country above the trees are Isabela and San Cristóbal with extensive areas, and Floreana with a limited one. On all of these the vegetation has been modified by the introduced cattle, and most of it consists of grassy downs. The ferns are found chiefly where the cattle do not penetrate.

Fauna

General. The animal life of the Galápagos is remarkable for two reasons. First, there are found certain peculiar and spectacular creatures, such as the giant tortoises and iguanas, which are found nowhere else in the world. Secondly, some of these animals present scientific problems of remarkable interest. Indeed, the fauna of these islands was one of the most important influences in directing Darwin's thoughts on to the subject of evolution and the origin of species.

All the native animals are remarkably tame. Sea lions, iguanas,

many of the sea birds and the Galápagos hawk allow themselves to be touched, and other birds do not move off until one is a few yards away. In contrast the domestic animals which have been turned loose are mostly timid.

Partly as a result of their tameness, the native animals have been extensively slaughtered, and some are in danger of extinction. Most of the animals have still been studied very little in the wild, and as they are found nowhere else and are of such special interest, it is particularly to be hoped that the remnant can be saved. The Ecuadorean government has passed regulations prohibiting the destruction or removal of any of the more interesting animals except under licence. The following is an extract from the decree:

'The following islands of the Archipiélago de Colón are declared National Reserves for Flora and Fauna: Española; San Salvador; Pinzón; Santa Fé; Rabida; Baltra (Seymour); Daphne; Genovesa; Marchena; Pinta; Wenman; Culpepper; and the part of Isabela comprised between Albermarle point and Perry isthmus.

'The hunting and capture of such animals and birds as may be specified by the Government is hereby prohibited.

'No living animals may be taken away whose hunting is prohibited, even in cases where the animal has been domesticated.'

Reptiles. Giant tortoises formerly occurred in great numbers on all the main islands, and grew to immense size, the largest being $5\frac{1}{2}$ ft. long, $4\frac{1}{2}$ ft. broad and 3 ft. deep and weighing at least 3 cwt. The tortoises formed a convenient source of food and were removed in large numbers by the buccaneers and whalers, while in the nineteenth century there was an even greater slaughter for their oil. The present settlers have killed most of the few that remain. As a result they are now completely exterminated on many islands, and where they still occur are mostly small. They are not uncommon on Isabela, and a few are left on Santa Cruz. A resident, Mr Lawson, drew Darwin's attention to the fact that on each island the tortoises were of a slightly different type. The only other part of the world in which giant tortoises occur is in some of the islands of the Indian Ocean, but here also they are nearly extinct.

Large green turtles are not uncommon in Galápagos waters, and lay their eggs in the sand on a number of beaches.

Next to the tortoises, the most remarkable animals are the two species of iguana. The marine iguana is common on the beaches of almost all the islands except Floreana and San Cristóbal. It is particularly common on the west side of Isabela, where herds of several

hundred may be seen. These lizards sometimes grow up to 6 ft. in length, but are usually 2–3 ft. long. They are generally dull black all over, but on some islands show pink below. They have a sluggish disposition and an archaic expression, and spend most of their time sitting on the rocks above high water. They can swim well and feed entirely on green seaweeds. They are the only purely marine lizard in the world, and in spite of a somewhat ferocious appearance are completely harmless (Plates 5, 6).

The land iguana is another heavy lizard, 2–3 ft. long and brownish in colour. Formerly abundant, it has now been exterminated on most of the islands, but is still common on Baltra (South Seymour). It is vegetarian, feeding largely on cactus, and is completely harmless (but one should not put one's hands too close to its powerful jaws). It is found nowhere else in the world.

Small reptiles include two kinds of lizards and a non-poisonous snake. These are all harmless, and, being represented on each island by rather different forms, are of considerable scientific interest.

There has been dispute as to how the reptiles ever reached the Galápagos. That all the species are found on nearly all the islands suggests that at some period in the past the main Galápagos islands were connected together though much of the geological evidence is against this view. But it is highly improbable that they were ever connected with the mainland of South America.

Mammals. Native land mammals are restricted to a bat, which is rare, and a rice-rat (an American type) represented by different forms on different islands. Both are peculiar to the Galápagos but related to South American animals.

In addition, a large number of mammals have been introduced, apparently in the early part of the nineteenth century, some deliberately to form a food supply for passing ships and shipwrecked sailors, while others escaped accidentally from ships or the plantations. Large herds of cattle roam the downs of San Cristóbal, Isabela and Floreana. They can be fierce, but usually run away. Small herds of horses occur on San Cristóbal and Floreana. Donkeys are found in the forests of Santa Cruz, Floreana and San Salvador, and their braying is a characteristic woodland sound. Pigs occur in the forests of Santa Cruz, Floreana and San Salvador, and goats on the barren semi-desert islands of Baltra, Santa Fé and Española. Large dogs are found on San Cristóbal, Floreana and Isabela, being timid on San Cristóbal, where they are shot, but possibly dangerous elsewhere. Black rats are exceedingly numerous in the habitations and in the



Plate 5. Head of marine iguana
The mouth has scaly lips behind which the teeth are concealed.



Plate 6. Marine iguana in natural surroundings
The lizard is about 3½ ft. long. The lava boulders on which it is standing are a typical habitat.



Plate 7. The plateau, San Cristóbal

A typical landscape on the eastern islands. The gentle slopes are covered with grass and bracken.



Plate 8. Progreso, San Cristóbal

The photograph shows the Indian village. In the background is a rolling plateau rising to the highest point of the island.

woods of San Cristóbal and also occur on Floreana, Isabela and San Salvador.

Of marine mammals, the Galápagos sea lion is still abundant on the beaches away from the settled areas, where it is killed by the inhabitants. Fur seals are said to occur. Killer whales and dolphins are common in Galápagos waters.

Birds. The Galápagos have many different kinds of sea birds but few of land birds. Some of the birds are closely similar to those found in Central America, some are moderately distinct, and others are highly peculiar and found nowhere else in the world.

Peculiar sea birds are the Galápagos penguin and flightless cormorant (found chiefly at Tagus cove) on Isabela, the Galápagos albatross (breeding only on Española), the large white fork-tailed gull and the smaller sooty gull, also some small storm petrels. Other sea birds include frigates, boobies of three kinds, the brown pelican, shearwaters and tropic birds. These breed chiefly on the small and uninhabited rocks and islands.

Coastal birds include flamingoes, four kinds of heron, stilts, and oystercatchers, while various shore birds occur which breed in North America. Water birds include a peculiar duck and rail, and moorhens.

The most interesting land birds are the Galápagos or Darwin's finches, which are abundant on all the islands. The males are sometimes black or black-headed, but others and all the females are dull brown or grey. They are about the size of sparrows, and have evolved into a great variety of forms, some with large heavy beaks, others with stout pointed beaks, while one looks like a warbler. One of them uses sticks or cactus spines to poke insects out of cracks in trees—one of the very few animals to use a tool.

Other land birds include a vermilion flycatcher, a larger grey flycatcher, a yellow warbler, a martin, a cuckoo, a mocking-bird (which is rather different on each of the larger islands), two owls, a hawk (like an English buzzard) and a ground dove. The last two have been killed off on most of the settled islands.

Other Animals. Fish are abundant and easily caught and red crabs are extremely common on the black lava beaches.

Mosquitoes are numerous between dusk and dawn in the coastal regions, mainly during the rainy season. Mosquito nets are essential when sleeping ashore at this time of year, but are not usually needed high up in the hills. Some of these mosquitoes are of kinds which can carry malaria. Fleas are extremely abundant in all the houses and

round all the settlements. It is impossible to avoid them when camping. Jiggers occur round the settlements, so it is undesirable to go barefooted. Termites do damage to clothing and timber in houses, but do not seem common and could be disregarded at a temporary camp. Ants are numerous and liable to get into any food. In the coastal regions very large blow-flies become a pest when meat is cooked, but otherwise are not troublesome.

Scorpions are fairly common near the coast, but their sting, though unpleasant, is not very serious (no worse than a bad wasp or bee sting in England). There is a centipede at times growing to 10 in. long which is apparently poisonous, but it is uncommon, and unlikely to sting.

Problems of the Fauna and Flora

In general it may be said that the fauna, with the exception of the wide-ranging oceanic birds, is most closely related to that of Central America. The flora, on the other hand, has strong resemblances to that of the west coast of South America. Why there should be this difference and how the animals and plants arrived at the islands is at present an unsolved problem.

The occurrence of distinct but closely related forms of animals and plants on the major islands is thought to be due to small groups of individuals having been prevented from interbreeding for a long time. Most of the animals do not swim at all and even the marine iguana never goes far from land, so the sea with its strong currents forms an effective barrier between the islands. Some of the finches are found on several islands while others are more restricted. They can fly from one island to another, but in fact seldom seem to wander far.

It is likely that each group of individuals will contain somewhat different genetical elements at the start, and continued inbreeding may result in Mendelian segregation. This, combined with chance selection, will in time produce populations having distinctive characters. In the case of the finches this process has been made easier by the absence of predators and of other kinds of small birds with feeding habits similar to those of the finches. As a result of this, competition for the various foods available to small birds, such as seeds and insects, has been slight or absent, and so variants suited to one or other of these diets have had every chance of survival.

A full explanation of the problems presented by this phenomenon has not yet been arrived at, consequently the suggestions outlined above must not be accepted as complete and final.

History and Administration

History

The islands were discovered in March 1535 by Bishop Tomás de Berlanga who found them by accident while on a voyage from Panama to Peru. He sent an account of them to King Charles I of Spain, in the course of which he remarked that 'it looked as if God, at some time, had rained stones'. The islands fell within the Spanish domain and remained a Spanish possession until formally claimed by Ecuador in 1832 after the conclusion of the Wars of Liberation.

When discovered they were uninhabited and remained so for long afterwards.

The islands were rediscovered by Diego de Rivadeneira in 1546 when he was fleeing in a small ship from Gonzalo Pizarro's insurgent forces in Peru. From then until 1684 they were visited occasionally and usually accidentally, though during this period Francisco de Castellanos, treasurer of Guatemala, applied for permission to explore and settle the islands; his request was not granted. At an early date the name Galápagos was given to the group from the abundance of giant tortoises (*galápagos*); the islands were also known as Las Islas Encantados (the Enchanted Islands) because they appeared very elusive in the days when longitude could not be determined accurately; dead reckoning was of little use owing to the strong and variable currents.

From 1684 to about 1720 buccaneers, mostly under British commanders, visited them when in need of food and water, or sometimes to hide from the Spanish. One of these vessels, the *Bachelor's Delight*, stayed three months while her sailing master, Ambrose Cowley, made the first general survey of the islands and gave to a number of them the English names which still appear on the chart.

Towards the end of the eighteenth century, when South Sea whaling was at its height, the islands were frequently visited by whalers who found convenient anchorages and an abundance of seals, together with some wood and water. In 1813, during the war between Britain and the United States over the question of the right of search of neutral ships at sea, Captain Porter, of the U.S. frigate *Essex*, made the islands his base. He made a prolonged stay and succeeded in compelling twelve British whaling ships to surrender. His journal contains interesting details about the islands and includes accounts of eruptions of the volcanoes on Isabela and Floreana.

About 1830, dyers' moss or orchilla (*Rocella tinctoria*, a lichen) was discovered in great quantity on some of the islands. As a result of the interest that this discovery aroused, Ecuador annexed the group in 1832 and Don José Villamil, who had brought the orchilla to the notice of the government, was made first governor and given a charter for the exploration of the islands. He settled them first with a few young men of good family but later with a medley of people recruited from unsuitable classes and occupations. The government supplemented these colonists with a mixture of its political opponents, military delinquents, and finally, common criminals. These were mainly settled on Floreana. The colonists, as was to be expected from such a rabble, destroyed the giant tortoises in great numbers, so that they became extinct on some islands.

When H.M.S. *Beagle* visited the islands in 1835 there were about 200 residents on Floreana. Her commander, Captain FitzRoy, made a thorough survey. This visit was one of the most important events in the history of the group, as Charles Darwin, who was surgeon-naturalist on the ship, carried out investigations on the fauna and flora which played a great part in the development of the theory of evolution (see p. 34).

By the middle of the nineteenth century, Villamil's settlement had fallen into decay through internal dissension, depravity and insubordination combined with the decline of the whaling industry. The domestic animals and cultivated plants introduced by Villamil ran wild and were occasionally exploited by temporary settlers and passing ships.

Various other attempts at colonization were made from time to time during the century but only two met with any success. Don Manuel J. Cobos built the settlement of Progreso on San Cristóbal and installed a sugar factory with steam power and made extensive plantations of cane as well as fruits and vegetables. By the end of the century water had been laid on; there was a schoolmaster, an inspector of police and a light-keeper on the island. The civil authority was supported by a military commandant, four non-commissioned officers and fifty men of the National Guard. In 1904, however, a revolt occurred among the workpeople and Don Manuel and the government commissioner were assassinated. A new commissioner was appointed and the settlement continued under the direction of the Cobos family, the numbers being about 300 in 1914. The successor of Don Manuel got into debt and most of the Cobos plantations have been taken over by a limited company which now

owns the village. In 1939, Señor Cobos, a descendant of the founder of the settlement, still owned a small plantation and lived on the island.

The other successful colonization was that of Señor Gil who in 1893 made a new settlement on Floreana which survived until 1897 when it was transferred to Isabela, where the village of San Tomás was built a few miles inland from Villamil. This settlement still continues to work plantations and export sulphur from the island.

During the present century there have been sporadic settlements by Europeans of various nationalities, mainly on Santa Cruz and Floreana. The chief of these occurred about 1924 when 200 Norwegians were settled on Santa Cruz and to a lesser extent on Floreana. This attempt has proved an almost complete failure, but the few survivors were still making a meagre living near Academy bay in 1939.

A U.S. base has recently been established in the islands.

Population

In 1938 the population of the group was slightly over 1,000. Most of the inhabitants lived on San Cristóbal and Isabela, the majority being Ecuadorean Indians. Santa Cruz and Floreana, where the settlers were practically all Europeans, were the only other permanently inhabited islands. On Santa Cruz there were a few Germans (said to be anti-Nazi refugees), one French Alsatian family, one Icelander, some Norwegians, a few Ecuadoreans, and a Frenchman. Spanish is generally spoken and the Ecuadorean population is, at least nominally, Roman Catholic.

Settlements. The principal settlements are on San Cristóbal at Progreso and on Isabela at San Tomás, which are both situated in the humid zone. A few houses and huts stand at the harbours of Puerto Chico and Villamil respectively. The houses are chiefly of wood with thatched roofs and one storey high. The houses of the manager and Sr Cobos in Progreso are two storeys high, of more solid construction and roofed with corrugated iron.

Local Administration and Social Services

The local administration of the islands is in the hands of the Jefe Territorial, who is the commander of the garrison on San Cristóbal. The commanders of the smaller garrisons on Isabela, Santa Cruz and Floreana carry out his functions on their respective islands.

The laws of Ecuador apply to the islands, but there are no courts and no police force. Most of the plantations on San Cristóbal are owned by an Ecuadorean company which is represented by a manager

who lives, as does the Jefe Territorial, at Progreso. The plantations in the neighbourhood of San Tomás and the sulphur workings are owned by Sr Gil.

From time to time individuals or companies have been granted charters by the Ecuadorean government for the settlement or exploitation of one or more islands. In 1939 the tendency seemed to be for the government to regain possession of the land, at least in San Cristóbal, though no definite steps had been taken.

There is a schoolmaster and a resident military doctor on San Cristóbal; the latter periodically visits the other islands with garrisons. Dysentery occurs in the group and malaria has been reported from San Cristóbal; plague does not seem to occur, in spite of the many rats.

Economics

Mineral deposits of almost every kind have been rumoured to exist in the islands, but the only resources actually known to be present in workable amounts are salt and sulphur. Sulphur is exported from Isabela, and salt, mainly used locally, is collected on San Cristóbal, San Salvador and possibly other islands. Guano occurs but not in workable quantities.

There are plantations on San Cristóbal and Isabela where coffee, sugar, bananas, sweet potatoes and other fruits and vegetables are grown. Coffee is the principal export. On the other inhabited islands plantations are owned and worked by individuals who do little more than grow their own food. Various domestic animals occur in a wild state on the islands. Details of their distribution have been given on p. 32. Hides are exported to Guayaquil. Fisheries are carried on in a small way mainly from Española, grouper and other fish being abundant. Fishing is chiefly done with a line, but large quantities can be caught wherever it is possible to haul a seine. The small boat on San Cristóbal is used for fishing; much of the catch is salted and dried (*bacalao*) and can be purchased. American tuna boats from San Diego visit the islands and fish in the neighbourhood.

In general Indian labour is adequate on San Cristóbal and Isabela, but there is no excess. On Santa Cruz and Floreana there is no available labour as each settler works for himself.

There is a small trade with Guayaquil, but exports are restricted in order not to interfere with government monopolies on the mainland. The trade in sugar and spirits appeared to have been stopped completely in 1939 and the sugar mills were abandoned.

Communications and Transport

Two auxiliary schooners belonging to the company which owns the plantations on San Cristóbal ply somewhat irregularly between that island and Guayaquil, making the journey about once in two months. They sometimes call at Isabela and Santa Cruz, and also at Española, where fishermen from San Cristóbal are left to be picked up on the return journey. Occasional calls are made at Floreana. Two gunboats tour the islands at irregular intervals to relieve the garrisons. Apart from these, inter-island communications are very limited. There is a small sea-going boat on Santa Cruz in addition to an open sailing boat with a small engine.

There is a road on San Cristóbal from Puerto Chico to Progreso and another on Isabela from Villamil to San Tomás. A few trails, usually passable for mules and donkeys, run near habitations and from these to the coast or the grazing grounds in the uplands. Bare lava, which is frequent in the coastal regions of most of the islands, is often difficult and sometimes impossible to walk over as it may be piled up in irregular jagged heaps, gives way underfoot, and is very sharp. Dense impenetrable thickets are found in many places.

Messages can be sent from Puerto Chico to Guayaquil by wireless telegraphy. The W/T station at Progreso was reported to be abandoned in 1939. There are no other means of communication, though letters may be sent by the schooners.

San Cristóbal

San Cristóbal (Chatham) is the easternmost island of the group and lies about 600 miles from the mainland. It is about 24 miles long and 8–10 miles wide (Fig. 10).

Relief and Vegetation

The southern and western parts of the island, including the central plateau, are composed of some of the oldest rock in the Galápagos, there being few recent lava flows. As a result most of the lowlying ground is comparatively smooth, usually gently sloping and covered with tall and uniform woodland. Progress is relatively easy though there are some areas, particularly near the coast, where the bushes form dense impenetrable tangles, and there are a few beds of jagged lava. In marked contrast, the northern and eastern parts of the island have experienced volcanic activity much more recently. There

are numerous perfect craters, many recent lava flows, the ground is broken, the contours irregular, vegetation is much more sparse, and many areas are almost devoid of it. There are no trails through the northern and eastern parts, and progress here is difficult.

From the south and west the ground rises gradually until vegetation transitional between the dry and humid types is reached, with much orchilla and numerous epiphytic orchids on the trees. Then there is a sudden short steep rise on to the plateau, all the lower slopes of which have been cleared. Here and there are extensive plantations and also large areas where the introduced guava has spread and forms dense stands some 20 ft. high. On the north and east sides the slope to the plateau is more irregular and much less fertile, no part being cultivated.

Above the cultivated area the ground continues to rise steadily. There are dense stands of guava, which decreases in size with increasing altitude. These give place to rolling downs, bright green in colour, covered mostly with grass and bracken (Plate 7). The contours of the hills are smooth and rounded (a sign of maturity) and there are no obvious craters except for a circular lake, El Junco, on the top of a high hill on the south edge of the plateau. The outlet of this lake forms a permanent stream down to Freshwater bay. There are several smaller ponds, probably permanent, which appear pink through being covered with a floating plant, *Azolla*. There are also a number of shallow ponds which contain water probably only in the rainy season. The only other permanent water is carried by an artificial drain running south-west to Progreso, which gives an ample supply to the inhabitants of the village. The highest point, 2,490 ft., is a steep rounded hill clearly visible from Progreso. Owing to its smooth outlines, this region is quite unlike any other part of the Galápagos.

Coasts

The southern and western coasts are formed chiefly by narrow beaches of black lava boulders, while in some areas there are low cliffs. On the north and east sides, on the other hand, there are some fine sandy beaches and also some steep high cliffs.

The south-west end of the island is formed by Wreck point which lies to the south of Puerto Chico and has reefs extending westward from it. Puerto Chico (Wreck bay), called on maps Puerto Baquerizo Moreno, is the principal harbour and is a rather open bay surrounded by steep sand beaches and low lava cliffs. It is bounded on the north by Punta Lido and to the south by Punta Malamocco and is $\frac{3}{4}$ mile

wide and $\frac{1}{2}$ mile deep. A reef, Arrecife Schiavoni, lies across the mouth of the bay and protects it from heavy seas. There are depths of 3 fathoms and less on the reef, with several rocks awash. The sea breaks right across the reef in heavy weather. About $3\frac{1}{2}$ miles eastward along the coast from Punta Lido is Isla Lobos, a low island. Punta Bassa, about 2 miles farther east, is low and dark coloured and marks the western end of Puerto Grande (Stephens bay), which is bounded to the north-east by Finger point. The bay is 5 miles wide and 2 miles long and may be easily recognized by Kicker rock, a cathedral-like structure rising steeply from the sea to 485 ft. about

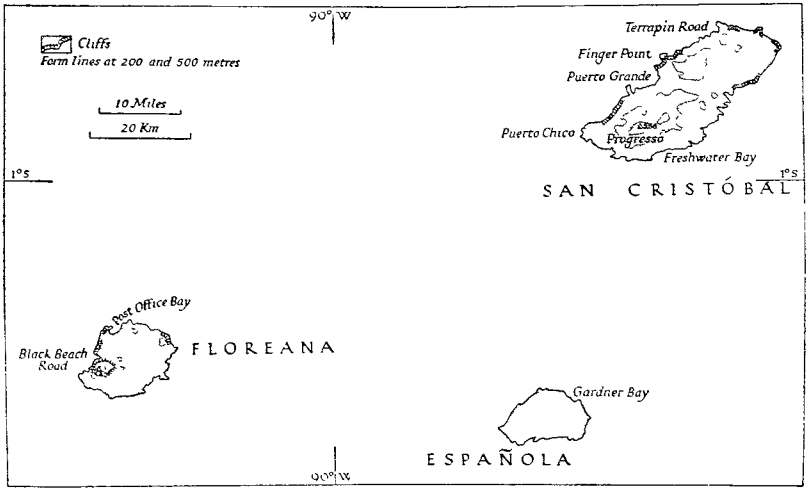


Fig. 10. Galápagos: eastern group
Based on American Geographical Society 1 : 1 M Map of Hispanic America, 1927.

2 miles north-north-east of Punta Bassa. Finger point is a conspicuous dark-coloured cliff with a pinnacle (actually a perfect crater when viewed from above) rising to a height of 735 ft. Sappho cove (in Puerto Grande), small and almost land-locked, is about 4 miles north-east of Punta Bassa; it is shallow and surrounded by low lava cliffs with a sandy beach which has a local growth of mangroves. Behind the beach there are pools of salt water from which a supply of salt is obtained. About 5 miles to the north-east lies Terrapin road marked by a hill 720 ft. high. Freshwater bay on the south coast is a very open bay exposed to a heavy swell. Water may be obtained with considerable difficulty in fine weather from a stream which falls from a 30 ft. lava cliff into the sea.

Anchorages. Puerto Chico is 6½–9 fathoms deep at the mouth, decreasing gradually towards the head; the 3-fathom line runs 200–300 yd. from the shore round the bay. There is anchorage in 6 fathoms, but the holding ground is not good and it is uncomfortable when the southerly wind is blowing. In the southern part of the bay there is a pier 150 yd. long, which in 1938 was dilapidated but usable. A light is sometimes shown from a tower 26 ft. high on the northern corner of a hut about 100 yd. east of the foot of the pier. The wreck of the Australian steamer *Cararva*, with two masts showing, lies in the bay. Landing on the beach is normally easy, but occasionally difficult owing to the swell. There is anchorage in 16 fathoms on sand in a bay ½ mile north-east of Punta Lido. There are many shoals and strong currents so that great caution is necessary in entering these bays.

Other anchorages on this coast are 1½ miles south-west of Punta Bassa in 6–18 fathoms, where there is a good boat landing in a sheltered cove, in Puerto Grande in 20 fathoms and off Sappho cove in 4–5 fathoms, which also has a good boat landing. Terrapin road and Freshwater bay are both open anchorages, the former in 12–14 fathoms half a mile from the shore and the latter in 20 fathoms 800 yd. from the watering place.

General

The population in 1938 was about 700 persons, the great majority of whom live on the south-western side of the plateau at Progreso. Here there are two large houses, one belonging to the manager of the company which owns most of the plantations, the other to Sr Cobos who has smaller plantations. There is also a store, a school, an incomplete church, and a large number of houses belonging to Ecuadorian Indians who supply the labour for the plantations (Plate 8). Water comes from the hills in a leet or artificial drain, but as Indians wash their clothes in the water above the point where it enters the settlement, and as dysentery is present among them, it cannot be considered safe to drink without boiling.

A considerable area is under cultivation round Progreso, mainly coffee, bananas, maize and sugar being grown. Sweet potatoes (*camotes*), lemons which have run wild, oranges and some other fruits and vegetables can also be obtained, and there are a few chickens. A plentiful supply of fresh beef is brought down from the hills.

A small number of other inhabitants and most of the military garrison live near the beach at Puerto Chico. Water has to be brought down to the beach from Progreso by ox-cart. In 1939 this was the

best method for watering ships available in the archipelago; however, if much water is required it is very slow.

A wide road runs from Puerto Chico up to Progreso. After heavy rain this consists of mud several feet deep and is impassable even for mules. But it dries rapidly and can be used for most of the year. Oxen, mules, horses and donkeys are available in limited numbers for transport.

Española

Española (Hood) is the southernmost of the islands lying 27 miles south-south-west of San Cristóbal. It is roughly oval in outline, the greatest diameter being about 10 miles. The contours are easy and the principal hill, flat-topped and lava-covered, reaches an altitude of no more than 640 ft. From Gardner bay the ground slopes gradually to the central plateau with several rocky hills about 100 ft. high. There is no permanent fresh water though extensive areas flood for a few hours after heavy rain.

The coasts are high and rocky on all sides but the north-east, where Gardner bay has long stretches of white sand and low rocky shore. The only anchorage is in Gardner bay, which is sheltered by Gardner island rising to a height of 160 ft. The anchorage is in 5–9 fathoms, but care has to be taken to avoid Magicienne rock which has only 14 ft. of water over it and lies near the centre of the bay. From the appearance of the vegetation and the low level of the island it appears likely that the rainfall is less on Española than on the majority of the islands.

There is a considerable amount of soil in the lowest parts, but most of the island has very little.

The island is uninhabited except for occasional visiting fishermen, and has no regular communications with the rest of the archipelago or with the mainland. Goats have been introduced and have run wild, thus still further reducing the already scanty vegetation.

Floreana

Floreana (Santa María or Charles) lies 37 miles west of Española. It is about 10 miles long and 8 wide and rises to a height of 1,780 ft. From the south fourteen volcanic cones are visible, seven of them being large; the tops of all of them are evenly rounded and the south-east sides of most are quite broken down. The central plateau, about 1,000 ft. above sea level, is several miles square and has a number of

tuff cones rising 500–700 ft. above it. Around the base of one of these cones are several springs of fresh water.

Coasts and Anchorages

The coasts are mostly low cliffs of lava and there are two anchorages, Black Beach road on the west side and Post Office bay on the north side. The former is known officially as Rada de Playa Prieta; the latter has been called Bahía Correos on some maps.

At Black Beach road the shores are low and rocky except for the beach of brown sand. There is heavy surf at times, but landing from small boats is always possible between the rocks. The anchorage is in 10–20 fathoms on a sandy bottom 600–1,000 yd. from the shore. There is water at a house at the end of a trail near the south-eastern side of the island. About one hour's walk inland from the landing place papaya can be obtained and limes, lemons and oranges grow wild.

Post Office bay is $1\frac{1}{4}$ miles wide, $\frac{3}{4}$ mile long, and provides a sheltered anchorage in 9 fathoms with good holding ground. The coast of the south side of the bay is rocky with occasional sandy beaches and a few small mangroves. The country inland is much rougher than that near Black Beach; there are several small cones, the highest being about 700 ft., with broad valleys between. Post Office bay gets its name from a barrel on a pole in which outward-bound whalers left letters which were collected by any homeward-bound ships which called at the island. This service is still occasionally carried on by visiting yachts. There is a more or less derelict house on the shore. The trail to the house near the south-eastern side of the island where water can be obtained is worse than that from Black Beach. The water supply is said to run almost dry in a dry year. Cormorant bay, about 2 miles east of Post Office bay, is an open sheet of water with a sandy beach and a small mangrove swamp at the western end.

General

There is a fair amount of soil in most places and less bare lava than on the other islands. On the plateau there are considerable areas of grassland mixed with open forest; cattle, said to number about 2,000, frequent this region. Pigs and goats have also been introduced and have run wild. The population in 1937 was 21, and the island was formerly visited from time to time by the inhabitants of other islands who came to hunt cattle and dry the meat.

Santa Cruz

Santa Cruz (Indefatigable), some 25 miles across, is situated centrally between San Cristóbal, Isabela and Floreana. The land rises gradually to a central high area, some points of which are rather over 2,000 ft. above sea level (Fig. 11).

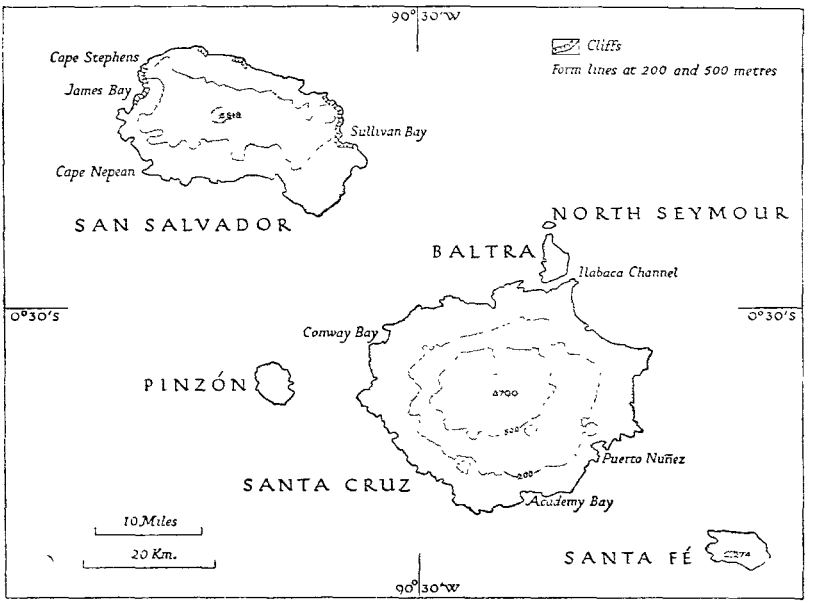


Fig. 11. Galápagos: central group
Based on American Geographical Society 1 : 1 M Map of Hispanic America, 1927.

Vegetation

On the south and west sides the low ground is well vegetated, with many tall trees among which the cacti *Opuntia* and *Cereus* are conspicuous. In some parts progress is fairly easy, but there are many dense impenetrable tangles. Furthermore, the ground is much more irregular than the low ground in the south-western parts of San Cristóbal, the surface consisting mainly of rough lava boulders, while deep fissures and cracks, and cliffs due to faulting are not infrequent. One such cliff about 100 ft. high forms the west side of Academy bay, while another (known locally as the Barranca) extends in a semicircle round the bay about a mile or two inland. As usual,

the vegetation is much more sparse on the north and east sides of the island.

In the southern and western parts, somewhat inland and up from the coast where there is a moderate amount of soil, large stretches of forest occur, transitional between the dry and humid. Here progress is not difficult in most parts. In the south-west this gives place to what is known locally as the 'tortoise country', which is covered with open scrub some 12 ft. high (mainly *Croton* and *Maytenus*) and grass (Plate 10). During the rainy season many temporary pools are formed which attract the tortoises which still remain.

Above the transitional forest occurs true humid forest (p. 30), and most of the plantations of the European settlers are situated between the lower and upper limits of this forest. In the region of the plantations most of the trees have been felled, but *Scalesia* is left and there is much grassland, so that an open parkland is developed. Away from the plantations there is well-grown forest with tall trees.

Above the humid forest is a dense and impenetrable area of low trees and bushes above which is open country. The latter is at a stage midway between the smooth rounded hills of San Cristóbal and the bare jagged volcanic cones which form the top of Isabela. On Santa Cruz the high land is covered with low vegetation but the ground is very irregular, with numerous fissures—some of great depth—long tunnels, some caves with entrances covered with ferns, and big cavities in the lava. Near the summit of the island are a large number of well-formed cones, but of smooth outline and mostly covered with grass or liverworts. As usual the southern crater rims are rather lower than the northern ones. In the centre of the north side of the high land is a conspicuous mountain, probably a plug of solidified lava exposed through the erosion of the original ash cone (Plate 9). The highest point is a cone about a mile to the east of this.

Coasts

Most of the coast is bordered by steep lava beaches or low cliffs. Academy bay, on the south coast, has cliffs about 100 ft. high bounding the whole west side and the seaward part of the east side, the rest of which has sandy beaches and low reefs. The bay is marked by a small wooded islet on the east side of the entrance. The next bay to the west has a long open sandy beach and is often mistaken for Academy bay. Beyond this is a lagoon and a small growth of mangrove. There is also a thick growth of mangrove in a small lagoon running into Academy bay. On the west side about 2 miles south of



Plate 9. 'Tortoise country', Santa Cruz

The small trees are widely spaced in this type of country; many of them have abundant epiphytes growing on them, as may be seen at the left of the picture.

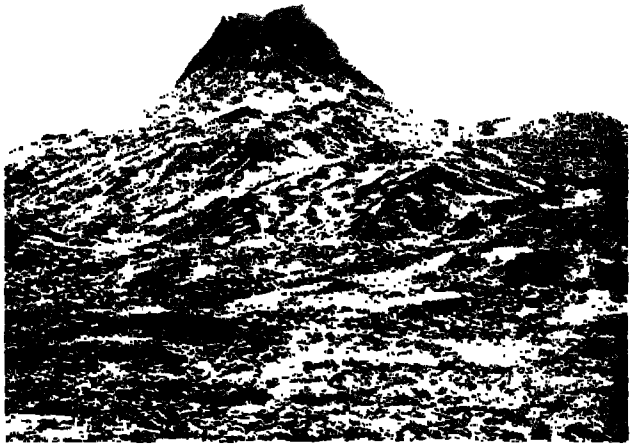


Plate 10. Uplands of Santa Cruz

The vegetation is similar to that in Plate 7. The steep hill is probably a plug of solidified lava, from which the ash of the original cone has weathered away.



Plate 11. Cumberland bay, Juan Fernández

In the bay are a visiting liner, one of the schooners which provide communication with Chile, and a number of fishing boats. Some of the houses of the settlement are hidden by trees and by the slope of the land.

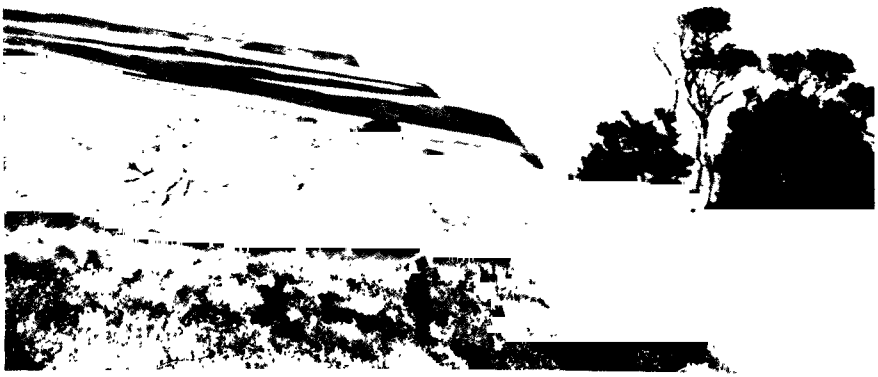


Plate 12. Más-afuera, Juan Fernández

The lava plateau slopes gently to the cliffs on the east coast and is deeply dissected by ravines.

Conway bay the coast is low with occasional beaches and small cliffs; Conway bay, the southern end of which is marked by Eden island lying close offshore, is similar. On most of the north coast the rocks slope gradually into the water and there are occasional beaches with small mangrove swamps, the largest of which is about 2 miles west of Baltra. At the eastern end of Ilabaca channel, the passage between Baltra and Santa Cruz, there is white sand with occasional rocks shoaling gradually north-west and steep-to on the south. Baltra (South Seymour) is a small island with the still smaller North Seymour and Daphne islands lying to the north and west. The east coast of Baltra is devoid of indentations, and the passage at the north, between it and North Seymour, is narrow and has a sandspit across it, but is navigable by boats. On the west coast of Baltra are two small bays, Birs cove and Bahía Baquedana, where there are sandy beaches; apart from this the shores are low steep cliffs. The island is almost entirely covered with large irregular boulders among which a few goats run wild. There was a volcanic eruption in 1825 and smoke was reported about 1910. The east coast has few indentations except for Puerto Nuñez in the south-east.

Anchorages. Academy bay is the most used anchorage, as the settlement is in that part of the island. Vessels anchor in 6 fathoms, close to the cliffs at the western side of the bay. Conway bay, where there is anchorage in 5–7 fathoms, is sometimes used. There is a good anchorage in 9 fathoms about 600 yd. offshore in Birs cove on Baltra with a landing place for boats on a sandy beach. An exceptionally fine anchorage is that at the eastern end of the channel between Baltra and Santa Cruz where there is fine white sand shoaling uniformly from 7 to 3 fathoms.

Water Supply

Immediately following a shower, streams abound in the high ground, and there is one which can be of considerable size flowing southward, while there are also a number of small ponds. But the streams can be seen dropping into big fissures, and within a few hours of a storm they have all dried up and the ponds remain but little longer. There are no crater lakes, though small and very temporary marshes are formed in the bottom of some of the craters.

The only permanent water supply is to be found at the brackish wells in Academy bay; this is drinkable but unsuitable for watering ships. During the rainy season the inhabitants collect large quantities of water from their roofs in tubs; they are usually unwilling to part

with it and the supply gives out in a month or two after the rains are over. The settlements in the hills have similar supplies which last rather longer, as there is more rain there.

General

Maize, sugar, pumpkins, *otoya* (a kind of yam), papaya, pineapples, oranges and small amounts of other fruits and vegetables are grown and there are also small numbers of chickens. Wild pigs are the main source of meat. A little fishing is carried on. There are no cattle and only one or two horses.

There are some houses round Academy bay where the captain and the garrison live, in addition to some of the European settlers. The garrison in 1939 consisted of about 50 men. The other settlers, mostly European, live in scattered plantations between the lower and upper limits of the humid forest zone on the southern and western sides of the island.

There is a well-used trail running from Academy bay through the forest to all the plantations in the hills. Its surface is covered with boulders and there is just room for two persons to pass. It is used by donkeys and, occasionally, horses. Small trails lead off it to all the main plantations, another branch runs through the dense bushy tangle above the forest to the open high land, and another to the 'tortoise country'. There are no trails in the northern and eastern parts of the island.

Pinzón

Pinzón (Duncan) is a small circular island reaching an altitude of just under 1,300 ft. It lies 6 miles to the west of Santa Cruz.

Santa Fé

Santa Fé (Barrington) is slightly larger than Pinzón and has a maximum altitude of about 900 ft. It lies 12 miles to the south-east of Santa Cruz and has a good anchorage for small craft in a cove behind an islet off the north-east point with a depth of 2 fathoms. Goats occur on this island.

San Salvador

San Salvador (James) island lies about 12 miles north-west of Santa Cruz and is about 20 miles long in an east to west direction. The eastern part is low, sloping up gradually to a broad central plateau

which extends to the base of the main volcano near the western end of the island. The altitude of the highest point of the island appears not to be known with accuracy, but probably lies somewhere between 1,700 and 2,850 ft. The Sugarloaf is a large tuff cone with steep sides 1,200 ft. high in the south-western part of the island. There are numerous small cones in addition to these two large ones, and in the crater of one of these there is a salt lake with a deposit of white salt several inches thick.

There is a good amount of soil and humus in most parts, but at one point on the south side there is recent lava from a small volcano which is known to have been active about the beginning of the century.

Anchorage. The shores are mainly rocky, with low cliffs in most places and few sandy beaches. James bay, on the west coast, affords an anchorage in 7 fathoms abreast of a sandy beach, or farther offshore in 15 fathoms. The best landing for boats is on the north part of the beach. The north side of the bay is bounded by cliffs rising in height towards the north-west and culminating in a high perpendicular cliff opposite Albany island. Sullivan bay on the eastern side of the island is an open anchorage with deep water. Even in the rainy season there is little water on the coast, though it is abundant in the uplands.

The island is uninhabited but pigs and donkeys are to be found in the woods.

Rabida

Rabida (Jervis) is a small island about 2 miles in diameter off the south coast of San Salvador. It has three peaks which are said to rise to heights of 950–1,050 ft. Along part of the north side there is a pebble beach near which is a small salt lake.

Isabela

Isabela (Albemarle), the largest of the islands, lies to the west of San Salvador. It consists essentially of five large volcanoes connected by the lava flows which have spread out at a gentle slope from the bases of the main cones. Three of these main cones, running in a north-west to south-east line, are joined to the other two, which lie in a line almost at right angles to them, by the low Perry isthmus (Fig. 12). The highest of the cones is probably rather over 4,000 ft., the others being somewhat lower. Much of the land is nearly bare lava, though locally, and particularly on the south-east sides of the

mountains, there is humid forest with good soil. Volcanic activity is of frequent occurrence, particularly in the north-western part of the island.

Coasts and Anchorages

The coasts, like those of the other islands, are mainly low and rocky, though there are in places high cliffs. Much of the coastline has regular indentations, similar to one another in width and depth, and this, combined with the lack of good landmarks, makes it very difficult to find the position of a vessel exactly.

Villamil, the harbour for San Tomás, lies on the south coast in a small bay open to the swell. There are a few houses here with a flagstaff in the north-eastern part, the main settlement being about 12 miles inland. The anchorage is poor and landing difficult. Turtle cove, about 6 miles west of Villamil, is said to be a better landing place. Iguana cove lies near the south-western end of the island between Essex point, a headland a little higher than the others in the neighbourhood, and Christopher point, recognizable by the mass of small cones behind it. The cove itself is available only for small boats, but larger vessels may anchor outside it in fine weather. It is surrounded by bluffs rising to 200 ft. and separated from the shore by a low flat plain, except in one place. South of the cove the shores are of low cliffs with occasional beaches of gravel and sand. Mangroves are absent from the cove itself but occur sporadically for some distance north and south of it. Webb cove, about 7 miles north-east of Christopher point, is somewhat more sheltered, but there is a still better anchorage 5 miles farther north; this cove may be recognized by two small hills with short sandy beaches each side of them. There is an excellent anchorage in 18 fathoms, 1,000 yd. from the shore, and a boat-landing on the southern side in a small indentation.

Elizabeth bay on the west side of the Perry isthmus is a moderate anchorage but the bottom is foul. Tagus cove, towards the northern part of the west coast opposite Fernandina, is a good sheltered anchorage in the remains of a crater. There are depths of 6–14 fathoms, and the shores are so steep as to be almost inaccessible, with tuff cliffs 40–50 ft. high on the south side; there is a landing place near a ravine at the northern end. The north-western point of the island, cape Berkeley, is a volcano which has been cut in two by a fault. The south-western half has disappeared and a cliff remains which is more than 2,000 ft. high; the remaining floor of the crater forms a shelf at about 1,000 ft. Albemarle point, which forms the northern end of the

island, has a reef extending one mile off it on which a fishing vessel lies wrecked.

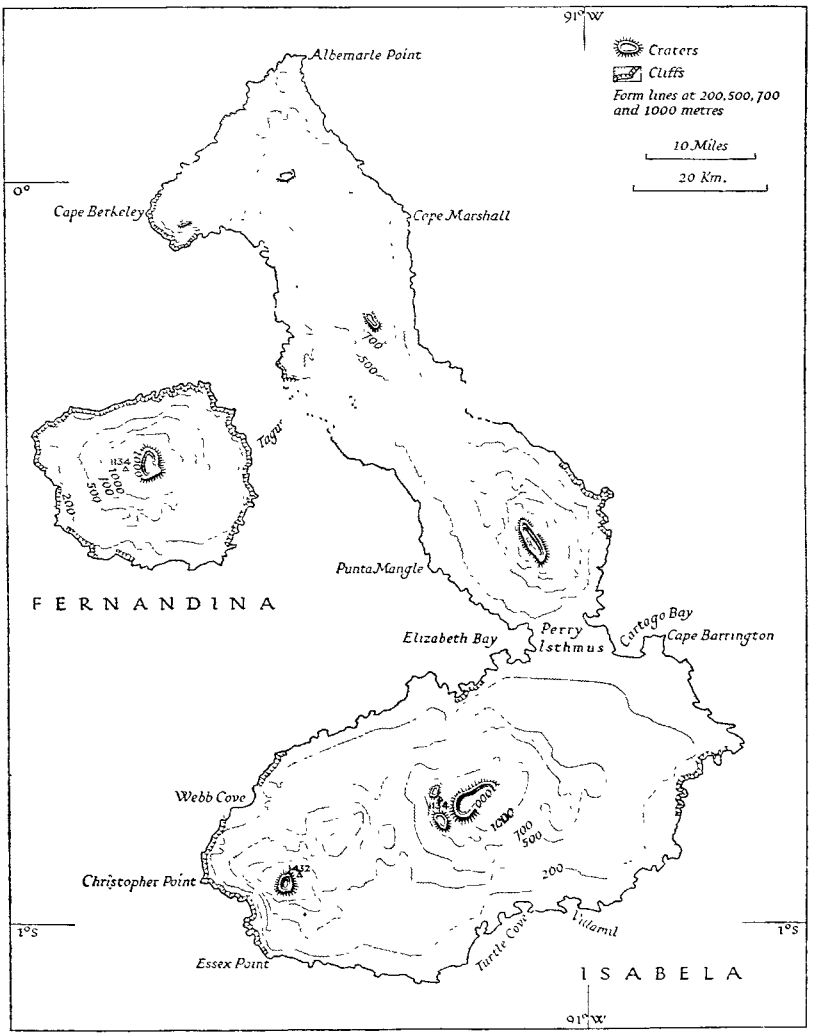


Fig. 12. Galápagos: western group
Based on American Geographical Society 1 : 1 M Map of Hispanic America, 1927.

Most of the east coast is devoid of anchorages and consists of a great number of small indentations very similar to one another in general appearance. Cartago bay, on the eastern side of the Perry

isthmus, affords a moderately sheltered anchorage in 11 fathoms, though landing is difficult on account of the dense growth of mangroves.

Settlement

The population of the island is about 400, the greatest number being in and around Villamil and San Tomás. A small garrison of 10–20 men was placed on the island in 1939, the commanding officer of the garrison representing the Jefe Terretorial. Various fruits and vegetables are grown, and there is said to be an indifferent water supply at Villamil.

Tortuga

Tortuga (Brattle) is a small island off the south coast of Isabela. It is the top of a tuff volcano the crater of which has been broken into on one side so that it is now crescentic in outline. It rises to a height of 275 ft., and the very steep sides have been eroded into gullies. Landing is possible on the north side, but only in calm weather.

Roca Redondo

Roca Redondo lies 14 miles off cape Albemarle and is 220 ft. high, barren and about a quarter of a mile in circumference.

Fernandina

Fernandina (Narborough) lies to the west of Isabela, from which it is separated by a channel 2–3 miles wide. It is a single large volcano reaching a height of over 4,000 ft. and surrounded by a field of lava. It is barren and uninhabited and frequently erupts. A number of parasitic cones were active in the southern part of the island in 1937.

Pinta

Pinta (Abingdon) is one of a group of three rather small islands (Fig. 13) which lie to the northward. It is 43 miles north-east of Albermarle point and reaches a height of about 1,900 ft. The highest volcano on the island was in eruption in 1928, and lesser degrees of volcanic activity have been frequently reported. The northern end is covered with bare lava, but in the southern part there is a certain amount of vegetation. Cliffs almost surround the island, reaching a height of about 1,000 ft. on the west side about $1\frac{1}{2}$ miles north of cape

Chalmers. There is a fair anchorage in 7–15 fathoms 600–800 yd. offshore on sand and rock at this point. Landing can be effected 1½ miles north of the anchorage, but there is no water on the island and it is uninhabited.

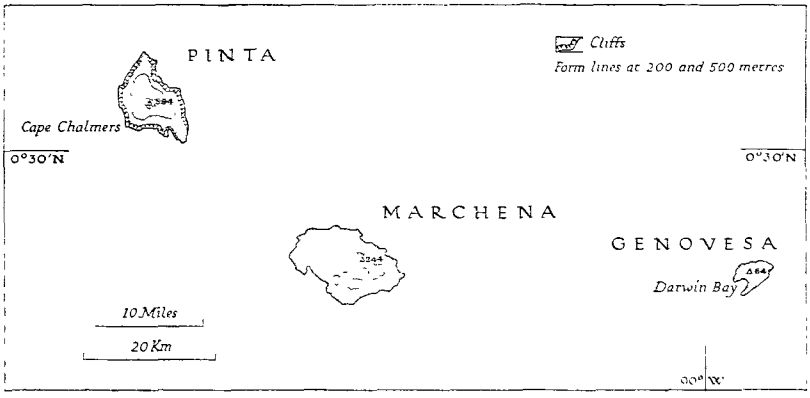


Fig. 13. Galápagos: northern group
Based on American Geographical Society 1 : 1 M Map of Hispanic America, 1927.

Marchena

Marchena (Bindloe) lies rather over 13 miles south-east of Pinta and is a lower island, the highest point being about 800 ft. As already described, the structure of this island is somewhat different from that of the others in the archipelago. The original volcanic cone has disappeared, leaving a caldera. The island is mainly covered with bare lava, though the north-east part is vegetated; its appearance is gloomy and forbidding. The coasts are steep, with cliffs in most parts; there is an excellent anchorage in a small cove with a black beach in the north-west part of the island where the bottom is sand, and there are depths of 5 fathoms very close in.

Genovesa

Genovesa (Tower) is 27 miles to the east of Marchena and is still lower, attaining a height of no more than 200 ft. It is about 4 miles across with a central crater half a mile in diameter; this is a much-frequented nesting-place for sea birds. There are 40 ft. cliffs almost all round the island except on the south side where Darwin bay is situated. This bay is the site of a crater of which the south-western wall has broken down, and is consequently circular in shape. The

entrance is 1,000 yd. wide with depths of 6–9 fathoms, and the bay deepens suddenly within, reaching more than 150 fathoms in the centre. The anchorage is suitable only for small vessels, being confined to a narrow ledge at the northern end of the bay with 4–5 fathoms and a sandy bottom.

Wenman

Wenman is an islet, formed from a crater with one side gone, lying about 75 miles northward of Albemarle point. There is a sharp and inaccessible ridge 830 ft. high in the middle, but one end is lower and flat-topped; landing is possible in fine weather. There are other small islets close to the main one.

Culpepper

Culpepper, about 20 miles northward of Wenman, is somewhat lower and equally difficult to land on. The north side is like a huge wall of masonry with each layer of rock about 6 ft. thick. On the west side there is a peculiar dome-shaped rock, while off the east side there is a reef ending in an arched rock of considerable height. Bushes and cactus can be seen on the top of the island and thousands of sea birds nest on it.

Neither Culpepper nor Wenman affords any anchorage.

SAN FELIX AND SAN AMBROSIO

San Felix and San Ambrosio (long. 80° W, lat. 26° 15′ S) are small islands off the Chilean coast nearly 500 miles to the westward of Chañaral. They lie on the same submarine ridge as Juan Fernández but about 500 miles farther northward. The ridge is defined by the 1,000-fathom line, the water to the eastward being 2,500 fathoms deep; the islands represent the summits of volcanoes comparable in height with the Andes.

The two islands, which are Chilean possessions, lie 11 miles apart and are both about 2 miles long. They were discovered by Juan Fernández in 1574; neither has ever been inhabited.

Structure

San Ambrosio is an imposing rock of black basalt, rising 833 ft. in a sheer precipice on its southern side and sloping to cliffs 328 ft. high on the north. The altitude of the summit is 1,571 ft.

San Felix, to the north-westward, is a low crescentic platform. A rounded hill, Cerro Amarillo, is 633 ft. in altitude and of a cinnamon colour. Off the south-eastern extremity is a separated hill of the same decomposed tuff as Cerro Amarillo, known as Islota González, and to the northward a single stack, Roca Catedral. The cliffs along the southern coast of San Felix are of jet black lava.

Landings and Anchorages

Landing is possible at one place on San Ambrosio and at several on San Felix. The only anchorage is on the bank between San Felix and Roca Catedral.

Vulcanism

The islands are of volcanic origin, but the only recent signs of activity followed the Chilean earthquake of 1922, when gases issued from crevices on San Felix and in the sea bottom in the neighbourhood. They caused a heavy mortality among birds and lobsters, and a visitor to the island was overcome by the gases.

Vegetation and Fauna

The general aspect of the islands is barren in the extreme and only fourteen species of plants are known from them. All but a few of these are confined to the summit of San Ambrosio where there is a certain amount of cloud and rather more moisture than elsewhere. Practically all the species are found nowhere else though their affinities are entirely American.

It is reported that there were formerly great herds of seals, but these have nearly or entirely disappeared.

No land birds are known to occur and the seven species of sea birds so far observed on the islands are all sub-tropical, none of the species characteristic of the cold water of the Humboldt current having been found.

JUAN FERNÁNDEZ

Juan Fernández is a small group of islands off the Chilean coast to the westward of Valparaiso. There are two principal islands, Más-á-tierra (lat. 33° 37′ S, long. 78° 50′ W) (sometimes called Juan Fernández) and Más-afuera (lat. 33° 46′ S, long. 80° 46′ W). Más-á-tierra, the larger of the two, is about 360 miles from the mainland and has a length of about 13 miles and an extreme breadth of 4 miles.

Más-afuera, which is 90 miles farther to the westward, is about $7\frac{1}{2}$ miles long and nearly $4\frac{1}{2}$ miles wide. Off the south-west extremity of Más-á-tierra and separated from it by a channel a mile wide is the small island of Santa Clara, about 5 miles in circumference. There are also about twelve small islets close to the coasts of Más-á-tierra and Santa Clara (Figs. 14 and 15).

The islands are a Chilean possession and form part of the province of Valparaiso.

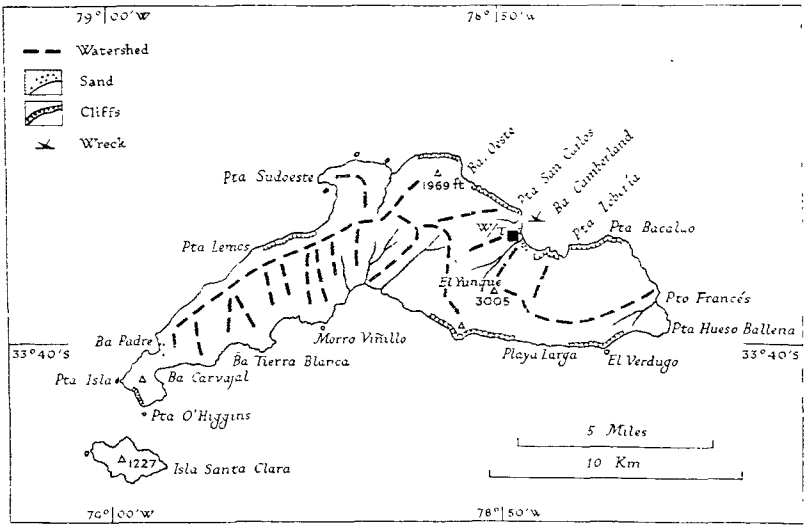


Fig. 14. Juan Fernández: Más-á-tierra

Based on Chilean government chart of 1921. (Heights in feet.)

Physical Geography

The islands are of volcanic origin and probably date from the early Tertiary. The lava and ash of which they are composed is beautifully layered in most places and is much weathered and cut up into deep, steep-sided ravines (*quebradas*) and numerous jagged peaks. The volcanic cones, which must have existed at one time, are no longer evident and there has been no activity on the islands themselves in historic times. There have, however, been violent earthquakes causing large waves which have damaged the settlement; one of these, in 1835, was accompanied by volcanic activity in the sea. It was witnessed by an English adventurer, Major Sutcliffe, who was at that time governor of the islands. He observed a dense column of smoke issuing from the sea about a mile off Punta Bacalao, which

'lasted till 2 o'clock in the morning, when an immense explosion took place, which threw water in every direction; during the rest of the night great bursts of flame rising from the same spot illumined the whole island'. About a month later soundings were made in the place and the least depth found was 69 fathoms.

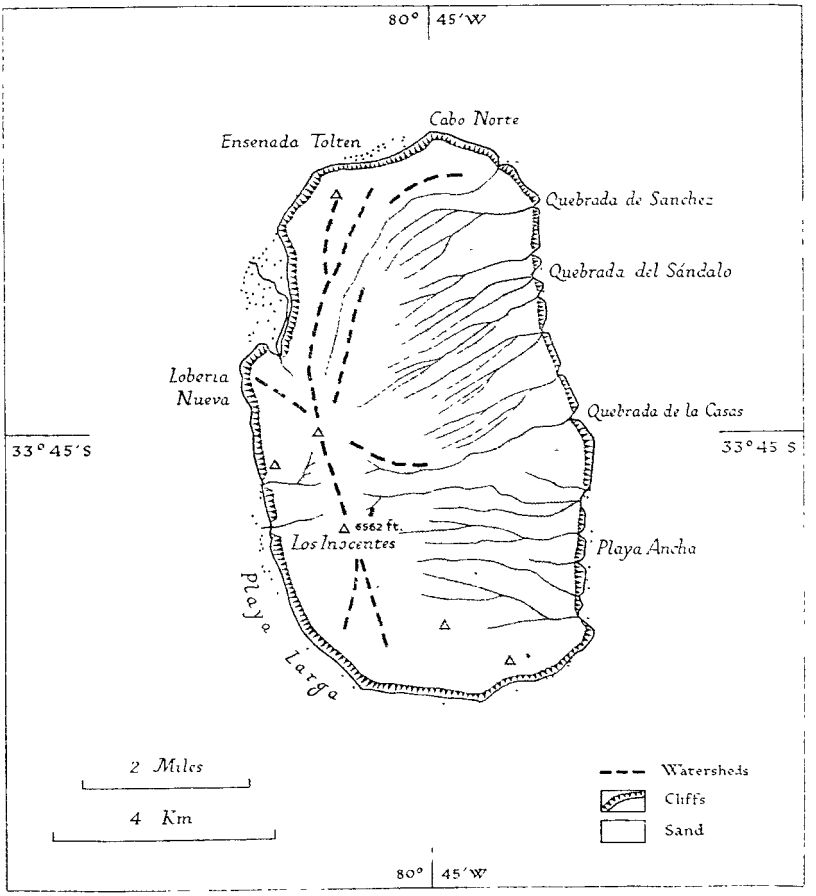


Fig. 15. Juan Fernández: Más-afuera

Based on: (1) Admiralty chart no. 1383; (2) C. Skottsberg, 'The islands of Juan Fernández', *Geographical Review*, vol. v, p. 363 (New York, 1918).

The coasts are rocky with many high cliffs and few indentations; Más-á-tierra has a good anchorage. The sea is too cold for the growth of reef-forming corals. (For coastal details see individual islands.)

Climate. In general the climate is mild and moist, frost is unknown, and even in the drier months (October to February) cloud frequently hangs about the mountains. The only climatic data available for the group have been obtained at the meteorological station in Cumberland bay on Más-á-tierra. These give a mean annual temperature of 59° F., the highest recorded being 86° F. in January and the lowest 39° F. in July and August. The mean atmospheric pressure is 1,020 mb. Winds are variable, but mostly between south-east and west. Rain falls on an average on 137 days in the year, the heaviest recorded fall in 24 hr. being 4·3 in. in June. The mean annual rainfall for 17 years was 43 in. In seven years' observations there was an average of 25 days of fog and 17 days with gales per year. Streams are plentiful, specially on Más-afuera, but none of them is large.

Vegetation and Fauna. The higher parts of the islands are well forested, except where the slope is too steep for soil to accumulate; the lower western part of Más-á-tierra is dry and has little vegetation. On Más-afuera there is grassland at low altitudes round the coasts, a region of forest on the lower slopes of the mountains, tree ferns above, and on the mountain tops grassland again, but this time with subantarctic affinities.

Fur seals were formerly abundant, particularly on Más-afuera, but it is doubtful if any now survive; it is said that a million pelts were once carried to London in a single ship. Elephant seals used to occur but have been exterminated by unrestricted slaughter for the sake of their skins and oil. Numerous sea birds rest on the islands and there is a species of humming bird of interest on account of the well-marked difference between the sexes.

History

The islands were discovered by Juan Fernández between 1563 and 1574, though the exact date is not now known. They were uninhabited and appeared always to have been so. During the succeeding centuries Más-á-tierra was settled, mainly by Indians from Chile, and a trade in elephant seals' oil and *bacalao* (dried fish) was carried on. Goats and pigs were introduced and did well, the former in particular thriving and running wild. Passing ships, usually pirates or privateers, paid visits for water or provisions and sometimes landed a few men. Alexander Selcraig (Selkirk) was landed at his own request in 1704 and remained on the island until the next ship called in 1709, providing the basic idea for Defoe's novel, *Robinson Crusoe.*

In 1749 the islands were claimed by the Spanish crown and became a colony with a garrison. This was transformed into a penal settlement and finally abandoned in 1814. Between 1797 and 1805 Americans and English visited Más-afuera to catch fur seals but were expelled by the Spanish frigate *Peruano* in the latter year.

Juan Fernández passed to Chile when that country achieved independence in 1819. Within two years the new government had started a prison for political offenders on Más-á-tierra; this was abandoned a year later. For the next century the island was periodically settled and abandoned, the settlers usually including some convicts or political prisoners. There were frequent disorders until the use of the island as a prison was finally given up. Towards the end of the last century the population of fishermen was reported to be orderly though its social life was morally discreditable. A few people have settled on Más-afuera from time to time, but none have stayed long.

In 1915 the *Dresden*, the last survivor of the engagement off the Falkland islands, was attacked by H.M.S. *Glasgow* in Cumberland bay and blew herself up after a few shots had been fired. This incident, occurring in Chilean territorial waters, led to an exchange of notes but was amicably settled.

Population

The resident population is about 450 and is confined to the settlement in Cumberland bay. The people are predominantly Chilean, speak corrupt Spanish, and are mainly Roman Catholics. In 1895 there was one Protestant on the island. No church or school existed then though both are reported to have been established since. The houses and other buildings are of wood and only one storey high.

Administration

The islands are governed by an official called a 'sub-delegate' who exercises the powers and performs the duties of all the government official posts. Chilean currency is in circulation. All the land is state property and has usually been let as a whole to a single lessee.

As far as is known there is no resident doctor, but the climate is a healthy one.

Economics

The only industry is fishing, mainly for a kind of lobster, *Palinurus frontalis* (allied to the rock lobster), which grows to a length of 2–3 ft.

and is much esteemed in Chile. This fishing, and the canning factories associated with it, provide employment for most of the population. Other kinds of fishing and especially the preparation of *bacalao* provide employment for the rest of the people.

Agricultural enterprises have met with little success in the past, and to-day fruit and vegetables are grown for local consumption only. There are small herds of cattle in some of the valleys, and goats have run wild in the mountains.

Uncontrolled exploitation of the forests in the past has resulted in the extinction of the sandalwood (*Santalum fernandezianum*) and a great diminution in the abundance of the *chonta* palm (*Juania australis*), both trees valued for their wood and found only in these islands. As a result of this there appears at present to be very little use made of the forests.

Communications and Transport

Communication with Chile is provided by three schooners which call at Cumberland bay about once a fortnight to load lobsters. Steamers call at long intervals. There is no regular boat service between the islands.

A few rough roads were made during last century; these have mostly disappeared, except for a few tracks in the vicinity of Cumberland bay.

There are no internal or inter-island posts, telephones or telegraphs. A W/T station on the western side of Cumberland bay, near the beach, provides communication with Chile and also performs a radio-beacon service on request.

MÁS-Á-TIERRA

The north-eastern part of Más-á-tierra is mountainous and has numerous craggy ridges and steep-sided valleys, which are usually well wooded; the south-western section is comparatively flat and low and more or less barren.

The highest mountain, El Yunque (The Anvil), is south-west of Cumberland bay, not far from the south coast of the island, and reaches an altitude of 3,005 ft. It is flat topped and conspicuously placed in the midst of a range of precipitous mountains (Fig. 16).

Coasts

In the western half of the south coast there are four bays, but the rest of the coast is without any considerable indentations and is all

steep-to and devoid of outlying dangers. About a mile from the eastern extremity there is a small, high, conical island, El Verdugo, which lies close inshore. Just to the north of the high and steep Punta Hueso Ballena (Guasaballena), which is the easternmost point of the island, there is the small bay of Puerto Francés. From there past Punta Bacalao to Punta Lobería the coast is a series of steep and rugged slopes reaching a height of over 1,000 ft. near the latter point.

Cumberland bay (Bahía San Juan Bautista) is on the north coast between Punta Lobería and Punta San Carlos, about $4\frac{1}{2}$ miles west of Punta Hueso Ballena. This bay is about a mile wide and half a mile deep and protected from all winds but the north, which is said never to be violent. It is, however, subject to strong squalls off the land during the winter. About $1\frac{1}{2}$ miles to the west is the shallow Bahía Oeste (West bay or Puerto Inglés) which appears large from the sea and can be mistaken for Cumberland bay; it may be recognized by



Fig. 16. View of north coast of Más-á-tierra

As seen from 5 miles to the north-west. Cumberland bay lies below El Yunque. Based on Chilean government chart of 1921.

the lower, less steep hills and the absence of a settlement. From here to Punta Isla there are a few small bays in the rocky, precipitous coast, and the mountains form a high ridge not far inland. Off the south-west coast between Punta Isla and Punta O'Higgins there are two groups of rocks extending about 200 yd. from the shore.

Anchorages and Landings. The principal anchorage is in Cumberland bay (Fig. 17 and Plate 11), the outer part of which is too deep for convenience. The 30-fathom line runs about 700 yd. from the head of the bay, and the best anchorage is inside this in the south-west part where the bottom is sand; to the south-east it is rocky and foul. There is a jetty in a very bad state in about 2 fathoms of water, and a landing place for small boats near by. There are facilities for watering. A light is shown from the ruins of the fort.

Good anchorages have been found in the two westernmost bays on the south coast, Bahía Tierra Blanca and Bahía Carvajal, in from 8 to 10 fathoms. In Bahía Oeste and Puerto Francés there is no anchorage, but landings can be made with difficulty. In the former,

the best landing place is on a beach of large boulders to the south-east of a perforated rock.

Vegetation and Fauna

In most places the forest has been destroyed near the coast and erosion is active. Here a weed, *Acaena argentea*, introduced from Chile, is very abundant. It has burrs which stick to cattle, sheep and goats and so gets carried everywhere. Above this cleared land, *maqui* (*Aristotelia maqui*), another introduced plant, dominates the vegetation, forming dense, dark thickets. The berries form the staple food of thrushes which must distribute the seeds in thousands every year. At a height of 600 or 700 ft. the original temperate evergreen forest of the island still exists and contains a great number of plants found only on these islands; some have no close relatives elsewhere in the



Fig. 17. The settlement and Punta San Carlos, Cumberland bay, Más-á-tierra

The gap in the skyline is known as Robinson Crusoe's Lookout. Based on photographs by W. Balfour Gourlay, 1927.

world. Ferns are abundant and a myrtle (*Myrceugenia fernandeziana*) with lustrous dark foliage and fragrant white flowers is the commonest tree.

The higher slopes of the mountains are cooler and wetter and there is a marked change in vegetation; tree ferns become common and the peculiar fern *Thyrsopteris elegans*, related to extinct ferns of the Mesozoic era, occurs. At the upper limit of the forest numerous miniature trees are found. These grow a few feet high, have rosettes of leaves at the ends of the branches, and most of them belong to families which are not ordinarily woody. For instance, there is a plantain and many members of the family *Compositae*, which includes the daisy and dandelion. In the bottom of each *quebrada* (ravine) there is a stream with sedges and plants of a kind called *Gunnera* with leaves resembling those of a gigantic rhubarb. In the barren

western part of the island European and Chilean weeds are abundant and quite obscure the original vegetation.

The paucity of the larger animals has already been mentioned, but it may be added here that the small animals, such as snails, spiders and insects, are abundant and many of them are peculiar to the island.

MÁS-AFUERA

This island has a remarkable appearance, being a roughly rectangular block of sheeted lava deeply dissected by *quebradas* and displaying perpendicular cliffs all round (Plate 12). There is a narrow strip of boulders along the beach, so it is possible to walk round the island and enter all the valleys which reach the sea. The west side is much higher than the east, reaching a height of 6,562 ft. at the peak known as Los Inocentes which lies in the main ridge from which the *quebradas* run mainly towards the east. The heads of these *quebradas* are usually occupied by high waterfalls, often nearly dry in summer, and there are numerous other waterfalls and heaps of huge boulders lower down the valleys. Each stream occupies practically the whole of the bottom of its valley, the sides of which are often 2,000 or 3,000 ft. high and too steep to be climbed.

Coasts

The coasts are rocky, precipitous and devoid of bays. On the south-west side there is a remarkable perforated rock, and about $1\frac{1}{2}$ miles to the north of this a low point projects, having a reef extending half a mile in a westerly direction. The sea continually breaks on this reef. The south coast is bordered with rocks. On the east coast at Quebrada de las Casas there is a deserted penal settlement; $1\frac{1}{4}$ miles south of this a reef projects 1,400 yd.

Anchorages and Landings. Landings on the island are usually made at Quebrada de las Casas, and it is possible to anchor off this place at $\frac{1}{2}$–$1\frac{1}{2}$ miles from the shore in 27–38 fathoms (Plate 13). Vessels have also anchored off Quebrada de Sanchez, the northernmost of the large ravines on this coast. Both these anchorages are unsafe in easterly winds. Carteret anchorage is situated on the north-west side of the island, where there is a bank of fine black sand and shell with depths of 20–30 fathoms. Fishermen have stated that there is anchorage all round the island, except on the south-east side. Landing is everywhere difficult and can only be effected in calm weather.

Water is plentiful, but difficult to obtain; fish are abundant and goats are found.

Climate and Vegetation

There is no exact knowledge of the climate, but it is in general similar to that of Más-á-tierra, except that frost is not infrequent on the higher mountains. The coastal cliffs and lower slopes are dry and warm and have a grassland vegetation. Between 1,000 and 2,200 ft. there is forest, similar to that on Más-á-tierra, except that the myrtle is of a different kind, found only on this one island. The upper edge of the forest has again a fringe of miniature trees, many of them different species from those found on Más-á-tierra. The forest limit is here a true climatic one, not due to the steepness of the slope or the activities of man, as it is on the other island, but probably to the low summer temperature. Above this there is the foggy region with extensive meadows and vast beds of ferns and, around Los Inocentes, a forest consisting of tree ferns and nothing else.

Above 3,500 ft. the scenery becomes more and more alpine, and it is here that various plants are found identical with ones which grow in the Straits of Magellan.

In the ravines a *Gunnera* with leaves 10 ft. across grows by the streams; its stalks are edible and refreshing, with a slightly acid taste.

EASTER ISLAND

Easter island (lat. 27° 10′ S, long. 109° 20′ W), discovered on Easter Day 1722 by the Dutch navigator Roggeveen, is about 2,230 miles from the South American coast and 1,100 miles east of Pitcairn, and is thus the most easterly island of Polynesia. In shape it is roughly triangular. An American official source gives the area as about 50 sq. miles. Other estimates vary between 55 and 61 sq. miles. Since 1888 the island has been a Chilean possession, and is known officially as Isla de Pascua or Rapa Nui. The old native name, Te Pito o te Henua, the Navel of the Earth, suggests the isolation of the island. It is probable that the name Rapa Nui, Big Rapa, was applied only in the nineteenth century by analogy with Rapa near the Austral islands, either by Europeans or by a native of Rapa in memory of his home. The latter is sometimes now referred to as Rapa Iti, Little Rapa, for distinction.

Great interest has been aroused in the archaeological remains which consist largely of megalithic sculptures in human form.



Plate 13. Quebrada de las Casas, Más-afuera

The deserted penal settlement is on the shore. The ravine (*quebrada*) behind it is typical of those on the east coast.



Plate 14. South coast, Easter island

The low rocky shore, rounded hills and short grass are typical of most of the island. The bluff in the background is Rano Kao. The windmill is one of several which raise water for sheep.



Plate 15. Hanga Piko landing, Easter island

This landing, on the west coast, has recently been improved by a concrete jetty. On the right is a wool store. The mountain in the centre is Tuutapu, 1,673 ft. high.



Plate 16. Fallen statues, Easter island

The statues are three of many which lie on the lower slopes of Rano Roraku.

Quarried on the slopes of Rano Roraku, one of the tuff cones in the eastern part of the island, many have been set up on stone structures (*ahu*) near the shore. Ethnologists have held various theories about these remarkable remains, which are discussed below (p. 74).

Physical Geography

(Figs. 18, 19)

The triangular shape of the island is determined by three extinct volcanoes forming the angles. The largest of these, Terevaka, rises to a height of 1,700 ft. with an eroded crater at the top. Some 6 miles

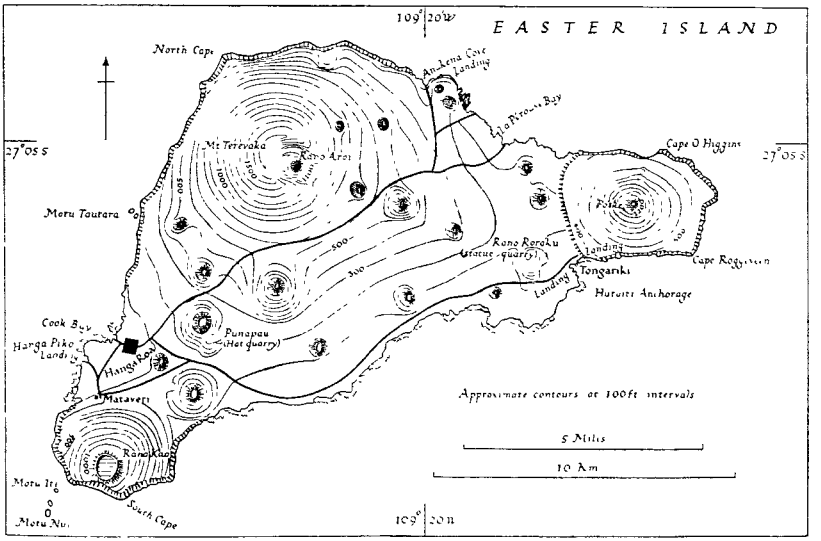


Fig. 18. Easter island

Based on: (1) Admiralty chart no. 1386; (2) L. J. Chubb, *Bernice P. Bishop Museum Bulletin*, no. 110, p. 32 (Honolulu, 1933).

to the south is Rano Kao; at the summit the crater is occupied by a fresh-water lake nearly a mile in diameter (Fig. 20). About 9 miles east of Terevaka is the third volcano, Poike, with a height of 1,200 ft. The area between the volcanoes, composed of lava flows, is flat rolling land. Grouped roughly in lines radiating from Terevaka are numerous parasitic cones of ash formation. The three principal volcanoes are also composed mainly of ash-like material, but the lava plain has outcrops of basalt and obsidian. The latter is unusual in the Pacific. The land surface everywhere shows the effect of disintegration rather

than erosion, since water tends not to flow in streams but is absorbed into the porous soil. The original volcanic masses have been little modified in outline and they retain their smooth conical form and easy slopes. Wave action has cut the steep cliffs which form the seaward sides of all three principal volcanoes and the landward side of Poike, the most easterly, indicating a former submergence of the coastal plain which adjoins it (Fig. 21).

A single stream normally fed by the overflow from the crater lake of Rano Aroi flows on the south of mount Terevaka for a few miles above ground and then sinks into the porous soil. Formerly, this stream flowed in an underground channel, but near its headwaters the lava roof has caved in forming a deep gorge with many natural bridges.

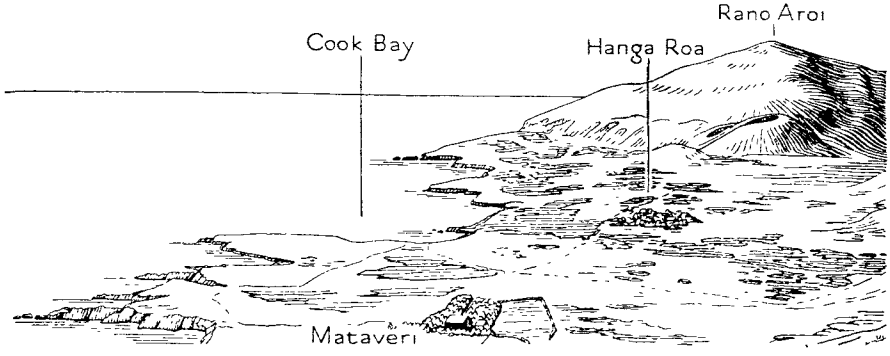


Fig. 19. Panorama of Easter island: looking north-east from Rano Kao

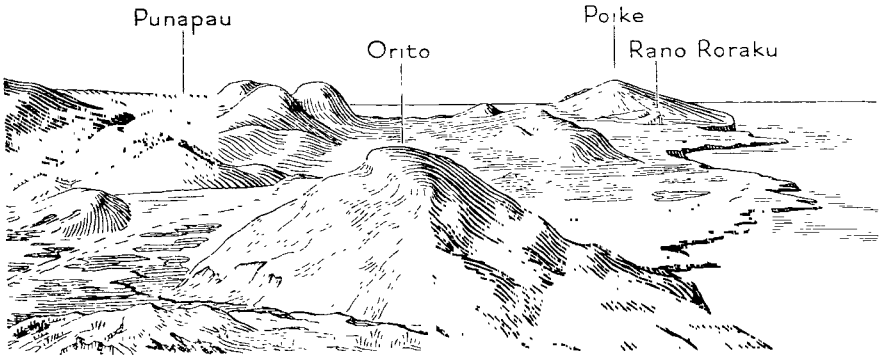
Coasts

In addition to the cliffs surrounding the seaward sides of the three volcanoes, there are low cliffs (Plate 14) along the shore varying in height from 80 to 100 ft. In places along the coast of the lava plain a shore-shelf a few feet above high-water mark is found. Sandy beaches are scarce. The largest of these is Anakena cove, in the middle of the north coast. It is about 200 ft. wide and provides a good landing. La Pérouse bay farther along the coast is rocky and not so suitable. Slightly to the east of La Pérouse bay is a sandy beach at Ovahi. There are two stretches of sandy beach on the shores of Hutuiti bay some 2 miles west of cape Roggeveen.

Anchorages. It is possible to anchor in from 25 to 35 fathoms on all sides of the island. But sudden changes of wind may make it

advisable to leave any anchorage and sometimes in stormy weather ships have to stand off and on for a few days. The best anchorages are in Hutuiti bay on the south coast.

Landings. At Hanga Piko there are a concrete mole, a small slip-way, a boathouse and a storage shed for skins. The mole has a length of 60 ft., and is equipped with a three ton hand crane. The boathouse can accommodate the five 5-ton lighters used for loading ships. There is also a rough stone jetty about 30 ft. long at Hanga Roa. The water alongside both is shallow and the approaches are partly obstructed by rocks. (Plate 15.) Landing can also be effected at two places in Hutuiti bay, at Vaihu about 4 miles north-eastwards from South cape on the south coast, and at Anakena cove on the north coast.



Based on a sketch by Mrs Scoresby Routledge, *The Mystery of Easter Island*, p. 122 (London, 1920).

Climate

Situated on the southern boundaries of the tropical zone, Easter island is subject to the south-east trade winds, which blow fairly constantly from October to April, varying occasionally to north-east. From May to September the island is affected by travelling depressions which cause unsettled weather, much rain, and sometimes strong winds which are usually from a direction between north-west and south-west. The winds are known locally as the *papakino*.

The range of the mean monthly temperatures over a year is from 62 to 73° F. There is little change from month to month. Even the hottest days are made agreeable by sea breezes, but the nights seem cold even to the natives. Fig. 22 shows average monthly temperatures

for a period of three years. The daily variations are between a maximum of 81° F. and a minimum of 67° F. in February and between 69 and 59° F. in July.

Relative humidity is high, varying between 77 and 82 %, and there are heavy dews at night.

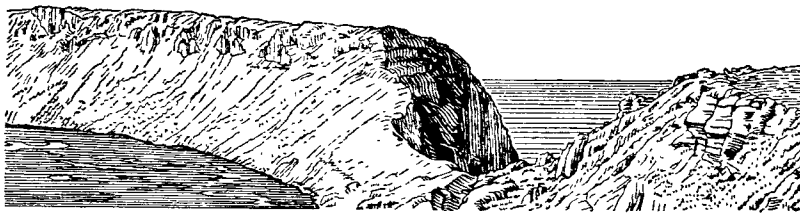


Fig. 20. Part of crater wall, Rano Kao, Easter island

Based on a photograph in Mrs Scoresby Routledge, *The Mystery of Easter Island*, p. 254 (London, 1920).

Rainfall is moderate, amounting to an average of 54 in. per year over a period of three years. Details of the mean monthly rainfall are also set out in the graph (Fig. 22). The maximum rainfall in any 24 hours seldom exceeds 2·5 in., though in June it has on some days been as much as 6·6 in. In this winter month there may be continuous



Fig. 21. Easter island: profile from the south-east

Based on L. J. Chubb, *Bernice P. Bishop Museum Bulletin*, no. 110, p. 34 (Honolulu, 1933).

rain for as much as a fortnight at a time. There are occasional droughts, but these are insufficient to affect the meagre vegetation of the island.

Water Supply

The soil on the upper slopes of the mountains is a light volcanic ash. In the plain it is formed of disintegrating lava across which walking or riding is difficult and slow.

Both soil and rock are so porous that rainfall is absorbed almost at once. Certain channels or ravines on the north coast are caused in all probability not by water action but by some structural faulting. The water table is low, only a few feet above sea level, and wells dug

near the shore become brackish. In former days the natives dug reservoirs along the shore where the coast was low. These consisted of ditches between 6 and 8 ft. deep. The seaward side was made vertical and very carefully constructed of well-fitting stone. The landward side sloped at an angle of about 45° and was paved with boulders. A few of these reservoirs still contain water.

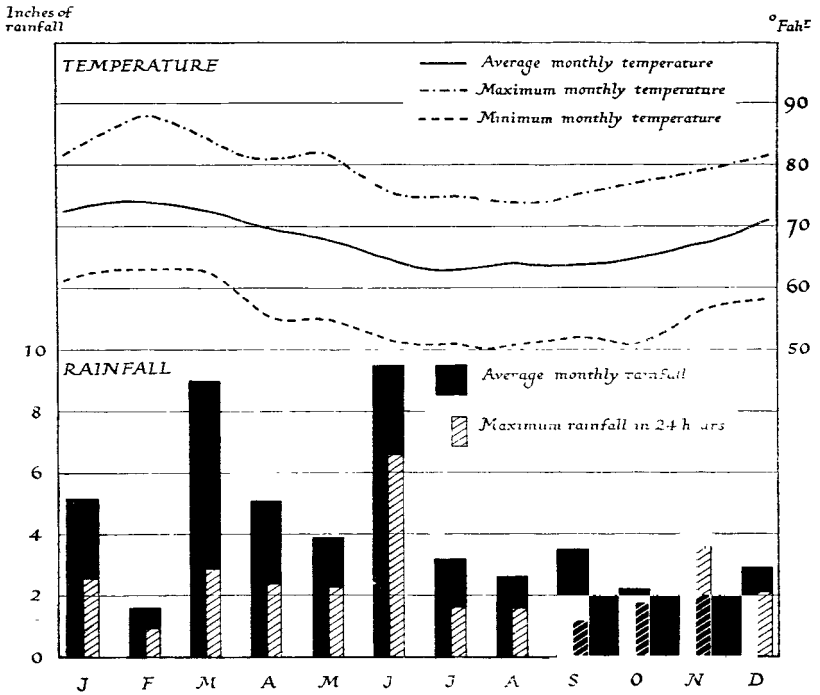


Fig. 22. Easter island: temperature and rainfall, 1911–13

Based on *Pacific Islands Pilot*, vol. III, p. 243 (London, 1931).

There is a well operated by a windmill near Hanga Roa which supplies water for the native settlement, and there are other wells similarly operated for watering sheep. The best sources of water for human consumption are the crater lakes of Rano Roraku and Rano Aroi. Small pipes have been installed to tap them. The latter supplies water to the Williamson, Balfour Company's settlement at Mataveri.

Vegetation and Fauna

Vegetation is scanty in the extreme. The whole island is covered with grasses, giving an appearance resembling the downland of parts of Sussex more than the usual tropical vegetation.

To-day the only trees planted in the island are a few in the village of Hanga Roa and in the garden of the ranch manager's house. These consist of figs, oranges and eucalyptus. A few shrubs of *Sophora toromiro* (a type of acacia), a few *hau* (*Triumfetta semitriloba*) trees growing in the interior of the crater of Rano Kao, and a few *makoi* (*Thespesia populnea*) on the side of the cliff at Poike were known in 1933. There has apparently never been a tree capable of providing a plank of more than 6 in. in width. This absence of timber has had a great effect on the material culture of the natives. Native food plants in the past included taro, yam, sweet potato, banana and sugar cane. Attempts have been made recently to introduce maize and one or two other types of plants.

At the time of Roggeveen's discovery the only indigenous mammal was the Polynesian rat which has since been exterminated by rats from European ships. The principal animal life consists of sea birds. Various kinds of terns, booby gannets and tropic birds nest in large numbers on the islands of Motu Kao Kao, Motu Iti and Motu Nui, which lie off the most southerly point of the island.

The major portion of the island to-day is given over to ranching. There are large numbers of sheep and cattle and a few horses. The natives keep a few pigs and dogs and a large number of fowls. Lizards are plentiful, as also are flies, cockroaches and mosquitoes.

History

The first European contact with Easter island was its discovery in 1722 by Roggeveen. The island was visited subsequently by a Spanish vessel commanded by Felipe Gonsalez in 1770. Cook, La Pérouse, Kotzebue and Beechey all visited the island.

The early visitors, including Cook and La Pérouse, were welcomed by the natives, but in 1804 the American Schooner *Nancy* kidnapped twelve men and ten women with a view to taking them to the island of Más-afuera to assist in the seal hunting there. This started the practice of 'blackbirding' or slave raiding which was seriously to depopulate the island, and was to make the natives hostile to landings by other vessels. Several similar raids were made by the same captain, and whalers frequently visited the island, usually to obtain women. After 1859 the exploitation of the 'guano' islands off the Peruvian coast and the shortage of labour led Peruvian ships to kidnap labourers from various parts of the Pacific. The largest of these raids on Easter island occurred in 1862. A gang of about 80

men from seven Peruvian ships landed and attracted the natives by spreading goods upon the beach before them to excite their greed. While the natives were scrambling after the goods, they were attacked by the slavers who seized and carried off some 200 people. All those carried off on this occasion died in Peru. The raid so discouraged and intimidated the survivors that they abandoned the cultivation of their fields and lived an anxious and miserable life in caves around the coast.

As a result of representations by the British and French governments, the surviving Easter islanders in Peru were returned. Only fifteen reached the island and these carried with them smallpox, which raged through the island, killing large numbers. Late in 1863 or early in 1864 the missionary Eugène Eyraud, a layman of the Congregation of the Sacred Hearts or Picpus, arrived and shortly after two priests with three Mangarevan assistants. At first there was considerable opposition to the mission, but by 1868 all the islanders had been baptized. The missionaries taught the natives to build plank-built houses, planted fig trees in the village of Hanga Roa, and introduced oranges, peaches, corn and pumpkins.

The successful work of the missionaries was upset by Dutroux-Bornier, a French subject, and John Brander, a Scot. They were two merchants from Tahiti who bought some land from the natives for a few pieces of cloth and established a sheep ranch. They stirred up a war between the natives of Hanga Roa on one hand and those of Mataveri on the other, finally compelling the missionaries to withdraw altogether from the island. All but 175 of the natives were induced to migrate to Tahiti to work on Brander's plantation, while the remainder stayed to work Dutroux-Bornier's ranch. Dutroux-Bornier was murdered. After his death the island was managed by a partner of Brander's, Alexander Salmon. Fortunately, Salmon was half Tahitian and was in sympathy with the natives. He improved their lot considerably, and in addition developed the island economically. By 1886 there were as many as 18,000 sheep on the island.

In 1888 Chile annexed Easter island, buying existing interests and leasing the whole territory with the exception of a small region round the village of Hanga Roa, 7·7 sq. miles in all, to the Compañía Explotadora de la Isla de Pascua (Williamson, Balfour Co.). This firm, which has offices in London and Valparaiso, still owns the lease, and has fenced off the native settlement from the rest of the island.

Early in October of 1914 the German Pacific Squadron used Easter island as a rendezvous. For a while, including supply ships, twelve

vessels were anchored in Cook bay. While they were there they established a look-out station on the islands. Later the German armed cruiser *Prinz Eitel Friedrich* spent Christmas there, revictualling.

People

Population

Apart from the European and Chilean employees of the Williamson, Balfour Co., the total population in the island in 1942 amounted only to 577. Of these about 200 were of pure Easter island descent. The remainder were made up of the offspring of unions between the islanders and Tahitians, Chileans, Tuamotuans, Germans, French, English, Italians, Americans, or Chinese, who formed the mass of the labourers. There were also 14 Chileans, including the Governor, and a few Europeans.

The lowest figure recorded for the population was 111 in 1877 after so many had been induced to migrate to Brander's plantations in Tahiti. Since then, however, numbers have increased slowly to the present figure. In 1934, when there were 456 people, 306 were children. The ratio between males and females balanced exactly in that year. There were 228 of each sex.

They are all settled in the village of Hanga Roa on the west side of the island near Cook bay. Of the total area of the island of about 55 sq. miles the native settlement is rigidly limited to 7·7 sq. miles. Therefore the density of population for the area occupied by the native population is 59 per sq. mile.

Early estimates and native traditions of the total population at or before the discovery vary considerably, but it is probable that there was at one time a population of from 3,000 to 4,000 people.

Physical Appearance

The present inhabitants are Polynesian in their general appearance. They are of a relatively light brown skin colour, and have black straight or wavy hair. About 5 ft. 8 in. is an average height. Heads are long, foreheads relatively high and rather narrow. Their noses tend to be broad, though not excessively so, and their mouths slightly protruding. The chief variation from the majority of Polynesians is in the ratio of head length to head breadth; the average cephalic index of 74·6 is lower than that for any other Polynesian community. In general, however, the proportions and measurements of the islanders do not differentiate them greatly from other Polynesians. Various

comparisons of crania from Easter island have been made, and it has frequently been suggested that they bear a striking resemblance to crania from Melanesia. It is possible that these opinions may have been influenced by certain apparent similarities between the art of Easter island and that of the Solomon islands.

Language

The Easter islanders speak a dialect of Polynesian. In fact, this was immediately recognized as such when they boarded Cook's ship. There is no sound which does not exist in other Polynesian dialects, but perhaps the speech is most closely allied to that of the Tuamotu group. The vowels have continental values. Nine consonants, *r*, *ng*, *n*, *m*, *h*, *v*, *k*, *t* and *p* are used, and there is no trace of the glottal stop. The language is constantly changing. Many ancient words have been forgotten, and words borrowed from other Polynesian dialects and foreign languages are coming in. Thus a spiritual being is known as *tatane*, an obvious modification of Satan. Since the establishment of a school by the Chilean government, Spanish is spoken by many people. A few also understand English.

Culture

Owing to the various disturbances which have affected the life of the people, virtually nothing is left of their original culture.

At present there is no native authority, but in general the position of the old men is one of importance. Paternal authority and conjugal ties are generally respected, but theft is common.

The native religion to-day is based on the Roman Catholic instruction of the early missionaries. There is a large Roman Catholic church where services are conducted by a Chilean priest of German extraction. The people are most scrupulous and enthusiastic churchgoers.

In the one village of Hanga Roa there are in all about 50 houses, built of wooden planks in European style, with corrugated iron roofing. Three generations will often live in one house, but the household may also include brothers with their wives and children as well as 'visitors' who may be staying. The habit of staying with friends is very common, especially if a family is without resources. The congregation of several families in one house is due to the scarcity of wood on the island, and the expense of importing it. On marriage a native couple is allotted 25 acres of land in the native settlement area by the Chilean government.

Native agriculture consists of the growing of a certain amount of corn, taro, yams and sweet potatoes. Fishing is undertaken on a very small scale with European fish spears or occasionally with lines or fishing nets. Compared with other parts of Polynesia, fishing plays a surprisingly small part in the native economy. This again is probably due to the lack of wood which in turn affected the production of canoes.

A few of the natives are employed regularly by the Williamson, Balfour Co., principally as sheep guards. The land leased to this company is fenced off with barbed wire as a protection for the sheep, but the natives organize sheep-stealing raids very frequently, as much for sport as for subsistence. Once a year large numbers are employed for a short period during the sheep-shearing season. Wages for this are on a piecework basis depending on the number of sheep sheared. Skilled men will earn as much as 300 pesos (£7. 10*s.* 0*d.* at par) in the season. The Chilean government has established a standard salary for a day's pay, which amounts to 4 pesos per day plus half a sheep and certain other rations.

Archaeology

Considerable interest, both popular and scientific, has been aroused in the sculptures and inscribed wooden tablets of Easter island.

Scattered all over the island, and particularly near the quarry on the crater of Rano Roraku, are statues representing human figures from the waist up (Fig. 23). Originally quarried in the extinct crater, a great many of the largest were erected on the lower slopes of the hill. Others, unfinished perhaps because of a flaw in the stone, have been left *in situ*. A few are scattered in lines across the island, possibly as boundary stones. Statues of specialized form, crowned with cylindrical blocks or hats of a red tuff quarried in a small crater near Cook bay, were formerly seated on the stone platforms (*ahu*). These were the only crowned statues on the island.

The statues are all of the same general style though they vary in size and details. The largest is about 33 ft. over all, while small ones may be no more than about 5 ft. in height. They are simply and massively carved. The head tends to be flat, with prominent brows and deep-set eyes. The nose is broad and the lips pursed. Perhaps the most interesting feature of these sculptures is that the lobes of their ears are distended and pendulous. This may have some bearing on the race of the sculptors of these statues, for it is not a general

Polynesian trait to enlarge the lobe of the ear, though large ear plugs are found in the Marquesas. But the practice of distending the lobe of the ear by inserting plugs of increasing size is common in Melanesia. (The Easter island style is shown in Plates 16, 17.)

The presence of these numerous statues has led to the question whether the ancestors of the present inhabitants would have had the ability to carve them or the means to move them, and has given rise to the belief that formerly a more civilized race occupied the islands in very ancient times. There is no foundation for this view. The statues were carved at a comparatively recent date. They are made

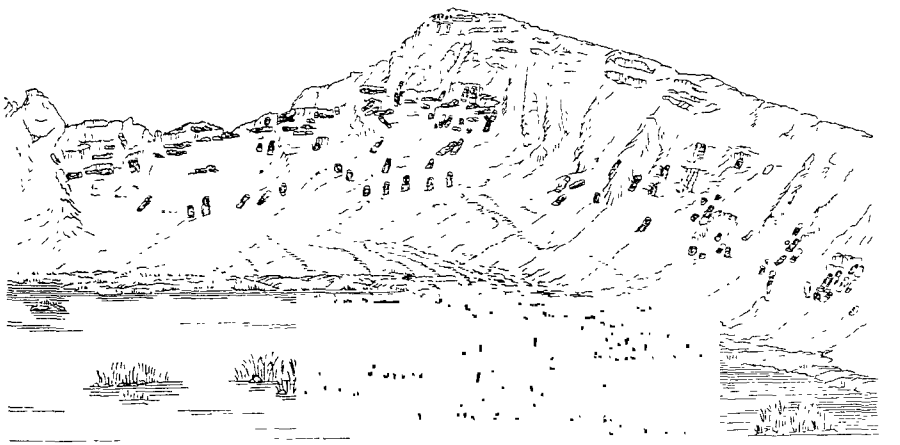


Fig. 23. Stone statues on the inner crater wall of Rano Roraku, Easter island

Based on a sketch by Mrs Scoresby Routledge, *The Mystery of Easter Island*, p. 175 (London, 1920).

from a compressed volcanic ash, which is easily worked by stone tools, many of which are to be found in the crater. Transport would not be difficult, for the smaller specimens rarely exceed three or four tons, and the large ones weigh perhaps only three times this. Suitable ropes for haulage could have been made from the bark of the *hau* tree. The backs of the statues would not be completed till they were erected, and any damage caused while they were slid along could be rectified afterwards.

In addition to the statues there are interesting relief carvings on rocks and boulders showing a bird-headed man carrying an egg in his hand. They refer almost certainly to a custom whereby, every spring, selected people from the dominant tribe at the time competed

to receive the first egg of a sooty tern from the nearby islet of Motu Nui. The man whose servants succeeded in obtaining the first egg became sacred for a year. He had to live in seclusion, but was maintained, as were his relatives and associates, by contributions from other tribes. The whole function was celebrated with considerable pomp and much feasting, partly of a cannibal nature.

There were also in Easter island small wooden tablets of *toromiro* (acacia) wood upon which a pictographic script had been inscribed. The pictographs were inscribed from left to right in the first row and upside down from right to left in the second, and so on. The tablets were part of the equipment of the learned men who used to recount the legends and chants of the people. Nobody who could read the script has survived into recent times, and the interpretation of it is still a mystery. It is probable that the characters were not phonetic but only mnemonic. That is to say, each symbol did not represent a definite sound but was simply a reminder of an idea which would enable the man to remember his chant. It has been suggested that the script bears a close resemblance to the ancient Indian script of Mohenjo-Daro, but while certain symbols in each script bear a close resemblance to each other there are a great many in each which have no counterpart in the other.

The relatively recent date of the bird cult and its related bird-man sculptures, which find counterparts in some of the characters of the tablets, is also opposed to the theory of any great age for the Easter island culture. If, as is comparatively certain, the script and the bird cult and the statues are more or less contemporary, and quite recent, it only remains to consider the probable origin of the sculptures. Mention has already been made of the distended ear lobes suggesting a Melanesian origin for them. It has been suggested that the sculptures themselves resemble the canoe prow gods of the Solomon islands, and that the bird-man element is parallel to the frigate bird which appears so frequently in the wood carving of the same islands. Fishing floats in particular assume the form of bird-man representations in Easter island. On the other hand, representations of bird men have been found on the island of Lanai in the Hawaiian group, another marginal Polynesian area. Stone sculptures as such are not peculiar in Polynesia to Easter island, but occur in the Marquesas islands and in the Austral group. In many parts of Polynesia, especially in Hawaii and New Zealand, sculpture in wood is frequent and elaborate. There is reason to suppose that Polynesians, bearing with them the tradition of wooden sculptures and arriving at an



Plate 17. Easter island stone statue

This statue, bearing the name Hoahakananaia (the meaning of which is obscure), was brought to England by H.M.S. *Topaze* and presented to H.M. Queen Victoria in 1869. It has been erected in the portico of the British Museum; it stands about 8 ft. high and weighs about 4 tons. The face is typical of the style of most of the stone figures.



Plate 18. Easter island wooden figure

The long ears, emaciated body and careful workmanship are characteristic of the male wooden figures. The eyes are of obsidian, set in shell. This figure is unusual in having fish carved on the head instead of the normal frigate bird. Height, about 14 in.

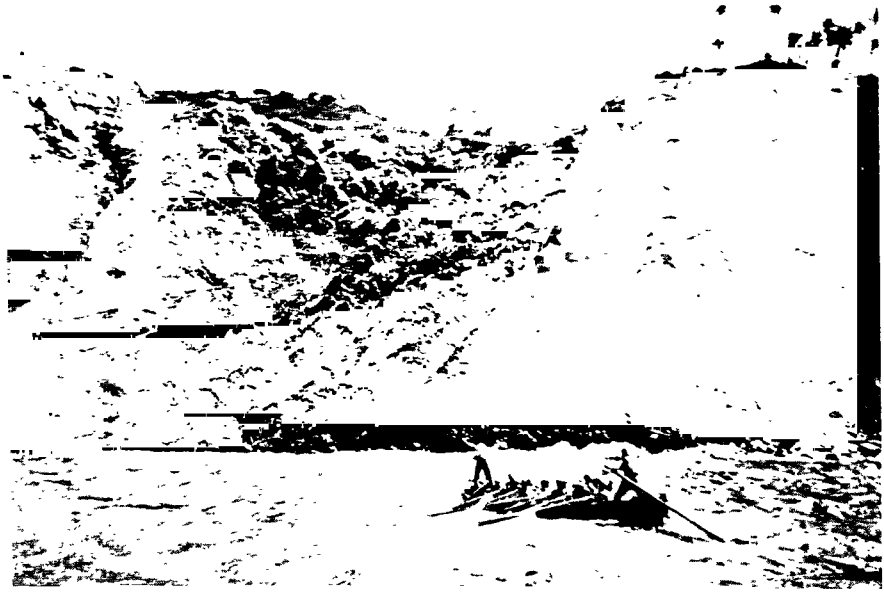


Plate 19. Pulling into the landing, Bounty bay, Pitcairn

Steering the boat through the breakers demands considerable skill. The landing place is at the left of the photograph, and the path to the settlement leads up the face of the cliff.



Plate 20. Landing place and boat sheds, Bounty bay

A fixed framework of timbers provides skids on which the boats are hauled up by hand.

island where wood was scarce, but where soft but easily worked stone was available, adapted their traditions and technique to the new medium. In fact wooden statuettes about 15 in. high and about 2 in. thick were made. These were most beautifully carved and represented slightly stooping emaciated men (Plate 18). Inferior flat carvings of women were also made. The male carvings bear little resemblance to the stone sculptures, but the ears are similarly distended, and there is a link with the bird cult in the carving of a bird on the heads of many of them.

The inscribed tablets and carved wooden statuettes are no longer to be found in the island, although the present inhabitants make inferior replicas as curios for sale to casual visitors. Good examples of the ancient art and inscriptions of Easter island can be seen in several of the larger ethnographical museums.

A final decision as to the possibility of a former Melanesian population may never be made. There is a strong case for the belief that the islanders have always been Polynesian and they are almost entirely so to-day.

Social and Economic Conditions

In former days the manager of the Williamson, Balfour Co. undertook the administration of the island on behalf of the government. To-day a Chilean governor has been appointed in addition to the officials of the company. A school has been established at Hanga Roa. A Chilean training ship formerly visited the island annually to supervise administration and to inquire into conditions on the island. The occasion of the annual visit was also one for distributing large amounts of old clothing collected from charitable institutions for the benefit of the natives.

The health of the population is good and today there are no people suffering from venereal diseases, but there were twenty-two lepers in 1942. Medical facilities include a hospital with accommodation for thirty patients, presided over by a Chilean medical *practicante* (male nurse), and a leper colony about five miles north of Hanga Roa. A Chilean Naval Medical Officer visits the island annually, remaining about a week. Crews of visiting ships must be medically examined before they are allowed ashore.

The principal resources of the island are sheep, cattle and horses, of which there are large numbers, but the difficulties of export prevent any development of a large-scale meat trade. Wool and hides are

exported annually in a small schooner, but most of the meat is consumed locally. Owing to this difficulty of export, horses have a local value of about 5*s*. a head.

Attempts have been made to induce the natives to undertake corn growing for export, but their unwillingness and the difficulties of transport would appear to be insuperable difficulties.

Communications

Apart from a schooner chartered by the Williamson, Balfour Co., there is no regular sea communication.

A road runs from the manager's house at Mataveri to Hanga Roa. From Hanga Roa two roads run eastwards. One, skirting the lower slopes of Terevaka, leads to the north coast at Anakena cove, Ovahi bay and La Pérouse bay. The other skirts the south coast to Tongariki behind the anchorage at Hutuiti. Other roads are shown on the Admiralty chart, but these have probably been abandoned. Transport is mostly on horseback, but there were two motor vehicles on the island in 1942.

A W/T station has recently been established by the Chilean government near the landing at Hanga Piko.

SALA Y GOMEZ

Sala y Gomez (lat. 26° 28′ s, long. 105° 28′ w approximately) lies about 205 miles east of Easter island. It is a barren uninhabited volcanic rock about half a mile long, and consists of two hills joined by a narrow isthmus.

It is a Chilean possession, but no attempt has been made to utilize it.

PITCAIRN

Pitcairn, Oeno, Henderson and Ducie islands lie to the south-east of the Tuamotu archipelago, in about 130° w longitude, just outside the tropics. Though they are isolated one from another, their general position and their political grouping make it convenient to treat them together. Pitcairn, the main island, is a British Colony by Settlement, and was brought within the jurisdiction of the High Commissioner for the Western Pacific in 1898. The other islands were annexed in 1902, and included in the district of Pitcairn.

PHYSICAL GEOGRAPHY

Pitcairn (lat. 25° 04′ S, long. 130° 06′ W) is about 2 miles long and 1 mile wide, and of irregular shape. It is of volcanic origin, solid and massive in structure, and reaches a maximum elevation of about 1,000 ft. in a peak to the west of the centre of the island. Most of the interior of the island consists of rugged uplands, sloping fairly steeply and often precipitously down to the sea (Figs. 24, 25).

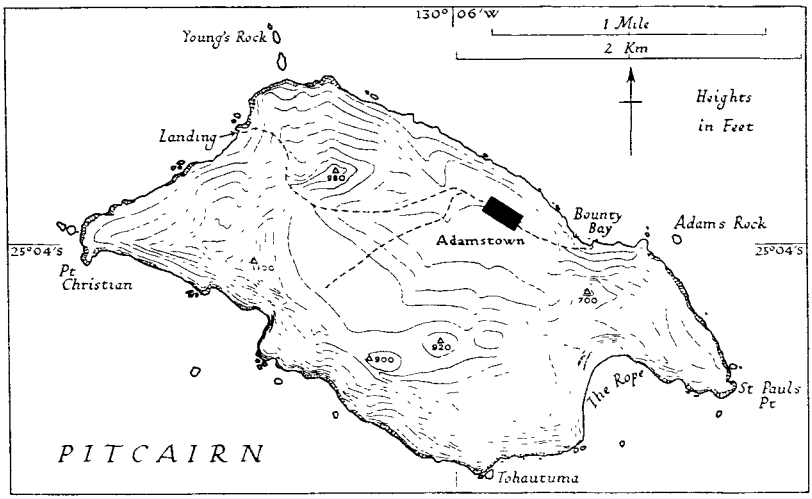


Fig. 24. Pitcairn

Form lines at intervals of approximately 100 ft. The highest point, marked at 1,100 ft. on the map, is given from the form lines; one source (Pedersen) gives the height as 1,445 ft., while the Admiralty chart and the *Pilot* give it as 'about 1,000 ft.' Tracks shown are main routes only; many subsidiary tracks exist. Based on: (1) Admiralty chart no. 783; (2) sketch survey by Alfred Pedersen, Templeton Crocker expedition, yacht *Zaca*, 1934.

Coast

The coast presents a series of formidable cliffs, of reddish brown or black volcanic rock, often vertical and rising to a height of several hundred feet, and nowhere giving easy access from the sea. Especially prominent features are St Paul's point with its lofty bristling rocks, the most easterly extremity of the island; point Christian, the western extremity; and the Rope, a high cliff in a bay on the south-east side —so named because a rope formerly hung there to assist descent. Off the coast are a few rocky islets, of which the main ones are Young's rock off the north end, and Adams rock off the north-east side. Pro-

tecting reefs and safely sheltered bays are absent, and the beaches, where they occur, are of pebbly shingle, small and narrow. Surf beats almost continuously on the shores.

Anchorages and Landing

The most convenient anchorage is off Bounty bay, a slight indentation on the north-east side, in 13–17 fathoms. The bottom is sand, with rocky patches.

Landing is practicable only at two places: at Bounty bay, and at a small cove on the west side. At the latter, landing is good in easterly winds, but ascent of the cliffs is difficult. At Bounty bay landing is practicable in moderate weather with winds from south-west to north-west. Here there is a narrow passage to the beach, between a dangerous rock-strewn shore and a jutting shoulder of cliff, and care is needed in negotiating the swell (Plate 19). Landing is best made

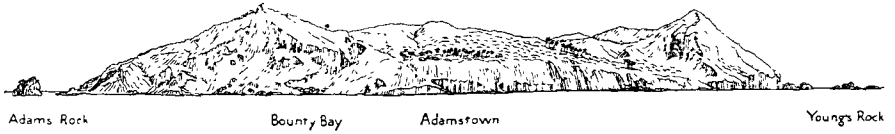


Fig. 25. Pitcairn: the north-east side

The drawing shows the main topography; much vegetation has been omitted. Based on a sketch by Alfred Pedersen, Templeton Crocker expedition, yacht *Zaca*, December 1934.

in the islanders' own boats, of whaleboat type, open, about 36 ft. long with 9 ft. beam and manned by fourteen oars. In the management of these craft the men are extremely skilful. On the beach a fan-shaped runway of logs has been laid down to facilitate the launching or hauling up of the boats to the boat-houses, a cluster of about a dozen open thatch-roofed sheds (Plate 20). At the back of the boat-houses a path leads up the cliff to the settlement about a quarter of a mile to the west on the heights above.

Climate

The climate of Pitcairn is equable; though rather warmer than that of Easter island, it is otherwise much the same. There are no regular trade winds, and in the summer (roughly September to March) the prevailing winds are from east-south-east to north. Northerly winds are light as a rule, and are often accompanied by rain or fog. The strongest gales are from the west and south-east. Hurricanes have been experienced, but are rare. One of the worst, in the night of

16 April 1845, destroyed the banana plantations, and with its accompanying heavy rain caused a landslide.

The range of temperature is not extreme; figures given (in the middle of last century) cite a lowest temperature of 59° F. in winter and a highest of 87° F. in summer; the average was stated as 65° F. in winter and 82° F. in summer.

Rainfall is not excessive, but details are lacking. Except in wet weather there are no streams on the island, but there is one spring; rain catchment provides the main supply of water, which is sometimes scarce. Each house has its own cistern of stone slabs cemented together, with an average capacity of about 1,000 gallons.

Soil

The soil, derived from decomposed lava, is for the most part a rich earth, of a deep red colour, though often black, owing to the humus from decayed vegetation. Scoriae are scattered about, but do not interfere with cultivation.

Vegetation and Fauna

The greater part of the island is thickly covered with luxuriant evergreen vegetation. Much of it in the cultivated areas in the centre and southern regions has been influenced by human occupation. Some of the steeper slopes are comparatively bare of all but grass and bushes. In the valleys and on the land of lesser slope the cover is thick, but paths enable it to be traversed. Lantana is a pest.

No systematic study of the flora is available, but the useful species growing there include coconut, pandanus, breadfruit, banana, paper-mulberry (*Broussonetia papyrifera*), candlenut (*Aleurites moluccana*); *miro* and *purau* (the former now almost exhausted) which yield building timbers; Polynesian food plants such as yam, taro and sweet potato; the ordinary potato, ginger, turmeric and sugar cane; a range of more recently introduced fruits such as orange, lemon, lime, pine-apple, melon, papaya, mango, custard apple, and guava; as well as a number of common European vegetables. The *ti*, a species of *Cordyline*, was once extensively cultivated for its root and leaves. The root yields a sweet liquor, from which a fermented drink was prepared; this is now prohibited, but the leaves are still used as animal fodder.

Little information exists on the native fauna. The only native mammal is a small rat, and there is only one species of land bird, a flycatcher. The noddy tern, white tern and frigate bird frequent the island in the latter part of the year, and the noddy breeds there. Fish of many edible kinds are plentiful off the coast, and squid, crayfish

and shellfish (about 40 species in all) among the rocks on the shore. There are three species of minute land shells. Small lizards exist there, but no venomous reptiles, and insects are few.

There are several types of introduced animals. Song birds were carried there by H.M.S. *Virago* in 1853, but no details are available as to whether they have maintained themselves. Domestic animals included in 1938 about 350 goats and 1,300 fowls. There are no cattle, and the islanders are said to have slaughtered their pigs years ago, owing to their religious tenets.

History

Pitcairn has aroused considerable popular interest from its association with the *Bounty* mutineers. The island was first seen by Ensign Pitcairn, who was serving under Carteret, in 1767, and it was then uninhabited, though stone adze blades, rock carvings and other prehistoric material have since shown that at an earlier period it was occupied by Polynesians. In 1790 nine of the *Bounty* mutineers, led by Fletcher Christian, together with six Tahitian men and twelve Tahitian women, arrived at the island, destroyed their vessel, and settled there in isolation. Nothing was heard of them till the American whaler *Topaz*, Captain Folger, called there in 1808 and was hailed in English by the half-caste youths who came off to her. In the interim all the mutineers except one had died, most by violence, and the island was ruled by the survivor, John Adams (formerly known as Alexander Smith), who had instituted a kind of patriarchal religious discipline over the growing mixed-blood community. He was left undisturbed by the British government, though action had been taken earlier against those of the mutineers who had remained in Tahiti.

As whaling developed in the south Pacific, Pitcairn, lying between fishing grounds, became a frequent port of call for water and fresh provisions, and the *Register* of the island records over 400 calls by vessels (mainly American whalers) between 1823 and 1853. The islanders traded their produce for goods. Relations of the whalers with the inhabitants were usually amicable, but to avoid difficulties Pitcairn was given formal authority for the election of a government magistrate accountable to the British crown, by Captain Elliot of H.M.S. *Fly* in 1838.

Meanwhile, as the population grew it had been decided, primarily at the request of the islanders themselves after a severe drought and

crop failure in 1830, to move them to Tahiti. They left in 1831 in transport provided by the British government, but, ravaged by disease, they returned to Pitcairn in 1832. Again in 1856 the people, by then numbering about 190, were removed to Norfolk island, which had just been abandoned as a convict settlement and which presented somewhat similar climate and facilities to their old home. But a number of families, pining for Pitcairn, went back in two groups, in 1859 and 1864. To-day the descendants of the *Bounty* mutineers and of a few men who joined the community at various times in the last century are divided between Pitcairn and Norfolk island, the majority being on the latter.

People

Population

Before the migrations to Tahiti and to Norfolk island the population of Pitcairn had been increasing rapidly, and since the return of one section in 1864 it has grown from about 45 to about 200 inhabitants. A figure of 199 was given in 1934, with sex and age distribution as follows:

Age (years)	Males	Females
Under 18	36	27
18–44	44	38
45–64	18	24
Over 64	3	9
Total	101	98

The amount of land suitable for agriculture is limited, and there is local fear of over-population. But while the population is increasing there is evidence that the rate of increase is slowing down. Comparison of sixty years before 1933 shows that in 1874–1903 there were 129 births and 38 deaths, giving a net increase of 91 people, while in 1904–33 there were 139 births and 69 deaths, giving a net increase of 70 people. Moreover, taking the decennial growth of population in proportion to the total population, there is an almost continuous fall from an increase of nearly 44 % in the ten years before 1874 to less than 12 % in the ten years before 1933. Again, the average number of children per female was 2·5 in the period 1890–1914 (the latest period available for study), whereas it was nearly double or more than double this at earlier periods. Hence it seems that a decline in fertility has set in, so that it may not be long before the birth-rate is hardly more than sufficient to maintain the existing population.

Physical Type

The Pitcairn islanders show in their physical traits evidence of both their English and Tahitian ancestry. Their average head length is almost identical with that of Tahitians, while their average head breadth falls within the English group range, far below that of Tahitians; the resulting cephalic index is intermediate between the English and the Tahitian. The average Pitcairn face is narrow, of English type; the nose of intermediate breadth. In general, the people have large prominent noses, slightly beaked, heavy brows defined by bony bars above the eyes, giving the forehead a pronounced slope in profile. In complexion they are ruddy and weather-beaten, in skin colour somewhat dark, with a high proportion of blue-brown, grey-brown and brown eyes. Roughly three-fourths of them have black hair. In stature the average of the Pitcairn islanders is higher than that of either the English or Tahitians, a phenomenon possibly due to hybrid vigour.

A marked characteristic of many of the islanders is loss of some teeth, causing in the more extreme cases collapsed lips and sunken cheeks. It is difficult to account for this, since their diet appears to be chemically adequate. In recent years, however, the services of a dentist may have tended to remedy this defect.

Language

In conversation with visitors the Pitcairn people use ordinary English, spoken with some peculiarities of accent. Among themselves, however, they speak a dialect of English which, with its curious pronunciation, debased syntax and interlarding of words derived from the Tahitian, is at first almost incomprehensible to outsiders. The enunciation tends to be soft and slurred, though some of the men who have been to New Zealand or Australia have adopted a more cosmopolitan style of speech and modern slang phrases. Nautical words and phrases are often used. Examples of the way in which English words have been moulded along Tahitian structural lines are: *ili-ili* (? hilly), describing a rough sea; *boney-boney*, very thin; *tomolla ha tudder one*, day after to-morrow. Tahitian words which have been incorporated are seen in *mono-mono*, very good (from Tahitian *mona*, meaning sweet); *ruma in the night*, meaning torch fishing, from the Tahitian *rama* which has the same meaning. And phrases such as *I tella you, I nor believe, What thing you want?* are typical of the clipped local English.

Culture

The culture of the Pitcairn islanders is an interesting growth, showing an adaptation of Tahitian and English elements to the environment, and the emergence of special forms suited to the character of the small isolated community life. In the early days of the settlement Tahitian forms such as bark-cloth garments, thatched roofs, segregation of the sexes at meals, and native dancing and music were prominent, but as contact with the outside world grew many of these were abandoned or replaced. But some Tahitian elements such as

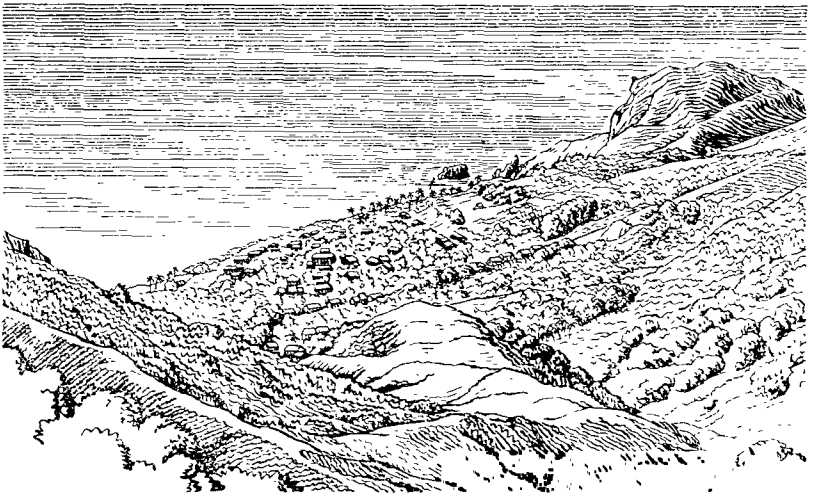


Fig. 26. Pitcairn: Adamstown

Looking out to sea over the settlement from a hill to the north-west; the houses are almost hidden among trees. Based on a photograph.

the five-pronged fish spear, the torch for fishing, the light fishing canoe, the *pillihai* pudding made from sweet potato or taro and coconut cream, are still retained in an original or modified form.

The people now live in simple unpainted houses, one storey high, with walls of roughly cut horizontal overlapping weatherboards, and corrugated iron roofs which are useful for rain-water catchment. The interiors are fitted with simple European furniture. The single settlement is known as Adamstown, and is a collection of about sixty houses arranged in a compact group but on no definite plan, among a thick growth of trees and shrubbery (Fig. 26). The principal buildings of the settlement are the church, the court-house (part of which is used

as a post office) and the school-house. A public bell is used to summon the people to an assembly or to give the signal for group activities such as road work, manning the boats, or coping with an emergency. A number of cabins on the higher slopes are occupied by many families for some weeks in the year as their seasonal work dictates.

European clothing is general, but two articles of local manufacture and wear are hats plaited from pandanus leaf and shoes of canvas with rope soles. Commonly, however, the people go bare-headed and bare-footed. The major occupations are agricultural, with some fishing and craft work.

The affairs of the island are run along democratic lines (see Administration), and great emphasis is laid on family life on the one hand and community interest on the other. Religion plays a great part in the life of the people, whose leaders since the days of John Adams have always given their education a strong doctrinal bias. Since 1886 the people have been Seventh Day Adventists, and as such are primarily vegetarians, though a few eat fowl, fish and goat flesh.

Opinions have sometimes been expressed that the islanders are physically and mentally degenerate, primarily as the result of inbreeding. This view is not supported by study. They are robust and healthy, with a good medical record apart from dentition, and their range of intelligence appears to be of quite average level, though their shyness may give an initial impression of backwardness.

Administration and Social Services

Pitcairn has had a formal administration since the election of the first chief magistrate in 1838, under the aegis of Captain Elliot, H.M.S. *Fly*. A code of laws was in existence as early as 1850, stating the duties of the chief magistrate, and providing for penalties for damage to public or private property. These laws were revised at various times, particularly in 1893 and again in 1904. The machinery of government was enlarged to allow of greater participation of the body of islanders in public affairs, and specific enactments were made to deal with offences not earlier recognized or common. A long-established practice was that of appeal to the commanding officers of British naval vessels that called, for final adjudication in disputes that the islanders were unable to settle themselves, and the revision of the laws in 1893 owed some of its changes to this.

Recently, the High Commission for the Western Pacific has issued

a further revised code of 'Instructions for the Guidance of the Local Government of Pitcairn Island', known as the Pitcairn Island Regulations, 1940. These regulations were assented to by the general assembly of all resident native-born inhabitants of the island over seventeen years of age, on 7 October 1941. Subject to the Regulations and Orders of the High Commissioner, they provide for the government of the island by the Island Council, consisting of the chief magistrate, two assessors, the chairman of the Internal Committee, and the island secretary. The first four officers are elected annually, to remain in office for one year, and are eligible for re-election; the secretary is appointed by the High Commissioner. Every native-born inhabitant or resident of three years' standing is entitled to vote, provided that he or she has reached 18 years of age. The Island Council, meeting monthly with the chief magistrate as president, enacts rules in regard to good order, prisons, public works, the public boats, education, the control of livestock, drainage and sanitation. It reaches its rulings by majority decision. The Internal Committee, consisting of its chairman and two members appointed by the Council, takes on the practical direction of most of these affairs. The chief magistrate, apart from his legislative and judicial functions, is the chief executive officer of the island. The island secretary acts as clerk to the Council and the Committee, keeps the Court records, and is the government treasurer.

Law. The laws of Pitcairn comprise in effect the regulations issued by the High Commissioner together with rules made by the Island Council. These are in most cases merely a reformulation of older regulations, and are essentially practical, in conformity with the history and way of life of the little community. They provide *inter alia* for the building, repair and handling of the public boats, specify the conditions in which women may go out in these boats, and deal with the use of the sugar-mill house. They set out prohibited areas for goat shooting, lay down that the ears of all goats killed must be shown to the head goat master, prohibit the killing of the noddy tern or the taking of its eggs between August and January, and the killing of the 'white bird' between August and December, and interdict the head of a family from keeping more than four breeding she-goats. They also pronounce guilty of an offence a person who fails when he is called upon by the Committee to act as public trader on ships which visit the island and has no lawful excuse. Among the penalties to which offenders are liable is a fine of 10*s.* for not cleaning up the road after splitting firewood upon it, and a fine of 5*s.* for calling 'Sail Ho'

when there is no ship in sight. Fines may at the discretion of the chief magistrate be worked out on the public roads at the rate of 5*s*. per day, or paid in oars or sailcloth for the public boats. Such rules and regulations in themselves give some impression of the economic and social conditions on the island.

Justice is in the hands of the Island Court, consisting of the chief magistrate sitting with the two assessors, or in minor cases possibly sitting alone. Jurisdiction of the court is limited to civil cases where the amount in dispute is not more than £10, and to certain types of criminal cases where no fine more than £10 or imprisonment more than three months is imposed. In criminal cases the punishment to be awarded is decided by the chief magistrate alone; otherwise concurrence of the assessors is necessary. All cases outside the jurisdiction of the Island Court must be heard in a High Commissioner's Court, with His Majesty's Supreme Court of Fiji as Court of Appeal.

Finance. There is no payment of taxation in money, and public works are accomplished by the labour required by regulation. Cash required for public use is acquired by collection or the sale of produce; tithes are paid to the church in the form of garden produce, and a proportion of this is sold to passing vessels. From their slender cash resources the people have made significant contributions not only to their own mission but also to international welfare funds.

Education. Education is controlled by the School Committee, consisting of the chief magistrate and four other persons, of whom three are appointed by the officers of the Pitcairn Island Church and one by the Island Council. The course of instruction is based by rule of the Council on a general Australasian primary school model, and includes domestic crafts for girls and manual crafts for boys. In 1934 there were forty-four pupils and four teachers, one of whom had been educated abroad, the others in the island school. The running expenses of the school are provided by church funds; salaries in 1934 ranged from £3 quarterly downwards. All children between six and sixteen years of age are required to attend school.

Health. The islanders on the whole are healthy and free from endemic diseases, though some tuberculosis, asthma and osteomyelitis have been found among them. Normally, skilled medical attention is not available, and they rely on a small supply of standard medicines, a variety of native herbs, and the services of the surgeons of ships that call. The recent temporary residence of a dentist has led to some improvement in their teeth.

Economics

Agriculture is the primary pursuit of the islanders. They cultivate a variety of fruits and vegetables (see p. 81) mainly on the upper levels of the central and southern part of the island, though small gardens are also worked near the settlement. The plantations are divided into a large number of individual plots. The spade and the hoe are the tools employed, and an underslung wheelbarrow is used for conveyance. Fertilizing the plantations with sea weed was formerly a common practice. In the middle of last century it was estimated that about half the island, that is about 600 acres, was under cultivation, the rest being too rocky, and it is likely that the area is much the same at the present time. Land is privately owned, and may in theory be disposed of, though it would seem that in practice such transactions are rare. Originally the land was divided into nine parts by the mutineers, with boundary stones, and has since been subdivided. No survey has ever been made. Lands may be disposed of by will, but it is customary on the death of a man to divide them equally between his widow and his children. On marriage a wife's land passes to her husband.

Another important occupation of the men is fishing, carried out from small boats holding a crew of two. Hooks and lines, formerly made locally but now imported, are commonly used, and the fish taken include red snapper, rock cod, tuna, barracouda and kingfish.

Craft work takes up much time of the men. The large boats of whaleboat type are made locally, of imported pine on a framework of native *purau* wood, and also the small fishing canoes, of candlenut and other local timbers. Both types of craft are sometimes sailed. The cutting and dressing of timber for boats and houses is an intermittent activity, as also is the pressing out of molasses from sugar cane in a communal shed. The turning, carving, inlaying and polishing of small wooden articles such as cups, boxes and walking sticks is a spare-time activity; these are sold on passing vessels. The wood most favoured, the red *miro*, is sometimes fetched from Henderson island, about 100 miles away, in the local boats. The women plait hats and baskets of pandanus leaf. About once a year each family spends a fortnight or so at Tauma, on the other side of the island, evaporating sea water in wide shallow pans to obtain salt. Tools are now imported, but the ancient anvil from the *Bounty* is still used for repair work.

There is no regular trade from Pitcairn, but fruit, vegetables, baskets, hats and other small hand-made articles are sold to the

vessels that call, or as formerly, bartered for cloth, soap, paper, needles and other simple goods. In 1937 about 2,000 cases of oranges per annum were exported to New Zealand by visiting steamers, and the annual income of the community, provided the orange crop was good, was estimated at £1,800–2,000. The banana crop though small was of good quality but shipping difficulties made it impossible to export. In recent years a number of Pitcairn men have gone to New Zealand for a time, working on roads, etc., and spending their savings on goods useful to them on their return.

Communications

There is no regular communication between Pitcairn and the outside world. When whaling died away the island depended largely on occasional visits from yachts, trading craft, and British naval vessels. But after the opening of the Panama canal, the island has lain on the direct route from London to New Zealand. Until 1939, vessels of the New Zealand Shipping Company and the Shaw, Savill and Albion line made a practice of calling there for a few hours in daylight, if weather permitted. The call was not scheduled, and was made entirely at the discretion of the master. The islanders use their own whale boats, which carry from 5 to 10 tons load, for transit between ship and shore.

The only means of wheeled transport on Pitcairn is the wheelbarrow, and the main road to the settlement, of earth surface, is really a narrow lane. From it footpaths lead off to the plantations and other places of interest. In 1938 there were about 15 miles of earth paths. The path from the main landing place to Adamstown has steps up the cliff; it is steep but safe. That from the emergency landing on the north-west coast is very difficult for the first 100 yd.; it rises abruptly up the face of the cliff and is dangerous unless assistance is given by the islanders.

There is no air communication with the island, and it is unsuitable for any form of air landing.

Signal Communications. There is neither telegraph nor telephone on the island. In 1939 there was an emergency W/T set (untuned) with an effective range of from 50 to 75 miles. Since the war it has been reported that the New Zealand government has installed a W/T operator there.

OENO

(Fig. 27)

Oeno (lat. 23° 55′ s, long. 130° 45′ w) lies about 65 miles north-west of Pitcairn. It is a low atoll, about 2½ miles in diameter, with some coconut palms on the land rim. There is a shallow boat entrance to the lagoon on the north side, but landing is dangerous. Water is said to be obtainable by digging in the sand.

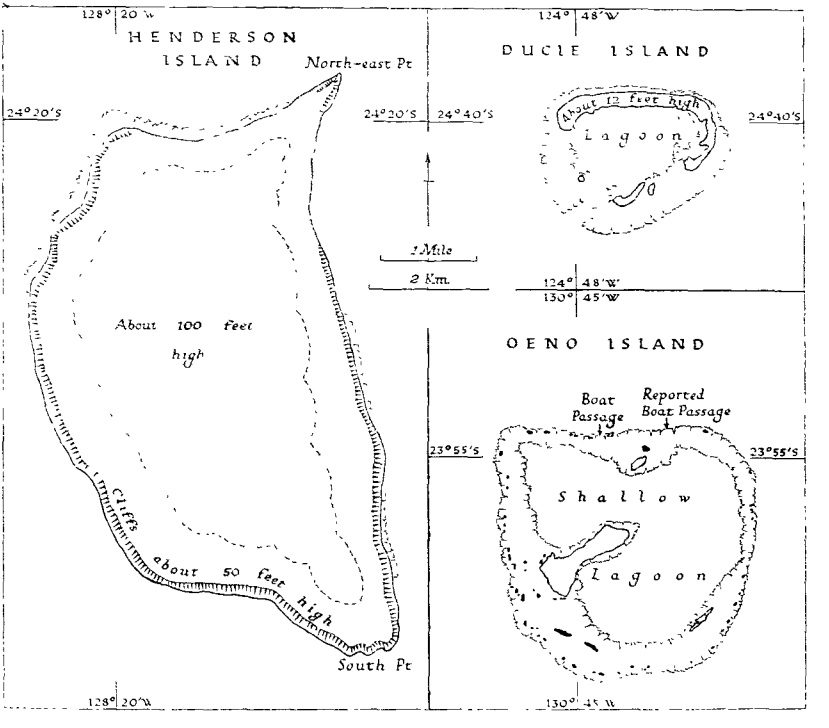


Fig. 27. Islands adjacent to Pitcairn
Based on Admiralty chart no. 987.

The island is uninhabited, but certain rights in it are claimed by the Pitcairn islanders. In 1934 bêche-de-mer fishing rights in it were granted by the High Commissioner for the Western Pacific to a private individual in New Zealand, but the concession was withdrawn in 1941. The *Khandeish* was wrecked on Oeno in 1875.

HENDERSON

Henderson (lat. 24° 20′ S, long. 128° 20′ W), formerly known also as Elizabeth, lies about 105 miles north-east of Pitcairn. It is about 5 miles long and $2\frac{3}{4}$ miles wide, flat-topped, and about 100 ft. in height. It is composed of elevated coral limestone. The island is steep-to all round, except at the north-west point, from which a coral reef extends, and on all sides except the north it is bounded by perpendicular cliffs about 50 ft. high, considerably undermined by the sea. Landing is difficult on account of the swell, and is possible only on the northern and western sides.

The surface is rough, with many cavities in the limestone, and is thickly covered in trees and undergrowth. A spring of fresh water runs below high-water mark from a cleft in the rocks at the northern end of the island. A small amount of rain water may be had in pools.

The island is uninhabited, but the Pitcairn islanders claim planting and other rights there, and resort there for timber and other products. A few coconut, lime and orange trees have been planted on the beach, presumably by them.

Henderson was discovered by the ship *Hercules* in 1819, and bears the master's name. Shortly afterwards the island was sighted by the ship *Elizabeth*, hence its alternative name. A boat's crew from the whaler *Essex*, which was wrecked near by, landed there in 1820.

DUCIE

Ducie (lat. 24° 40′ S, long. 124° 48′ W) lies about 290 miles east of Pitcairn. It is an atoll about $2\frac{1}{2}$ miles long by 1 mile wide and about 12 ft. high. Entrance to the lagoon is doubtful, but landing has been made on the north side. The island, which is partly wooded, is uninhabited. It was discovered by H.M.S. *Pandora* in 1791.

BIBLIOGRAPHICAL NOTE

General

A general account of the islands, including their history, is given in vol. XXII of the Foreign Office *Peace Handbooks* (London, 1920). Information is also given in the appropriate volumes of the *Sailing Directions*, viz. *Pacific Islands Pilot*, vol. III (1931); *South America Pilot*, part III (1941); *West Coasts of Central America and United States Pilot* (1935); U.S. Hydrographic Office *Sailing Directions for the Pacific Islands (Eastern Groups)*, vol. II (1940); U.S. Hydrographic Office *Sailing Directions for South America*, vol. III (1938); U.S. Hydrographic Office *Sailing Directions for the West Coasts of Mexico and Central America* 1937)—with later

Supplements in some cases. Short general accounts of the islands near the American coasts, with details of the birds, are given by R. C. Murphy, *Oceanic Birds of South America*, vol. I, part I (New York, 1936). Additional information about several islands has here been incorporated from official sources.

Specific sources for the more important islands are listed below. For maps see Appendix I.

Clipperton

A brief general account is given by G. Grandidier, *Atlas des Colonies Françaises* (Paris, 1934), and a fuller description, with historical detail, by K. Baarslag, *Islands of Adventure*, pp. 295–9 (New York, 1940). The structure of the island, its petrography and phosphate are dealt with in two short papers, by W. J. Wharton, 'Note on Clipperton atoll (Northern Pacific)', and by J. H. H. Teall, 'A phosphatized trachyte from Clipperton atoll', in *The Quarterly Journal of the Geological Society of London*, vol. LIV, pp. 228–9 (London, 1898), and by K. Elschner, *Corallogene Phosphat-Inseln Austral-Oceaniens*, pp. 91–2 (Lübeck, 1913).

Cocos

A. Stewart, 'The botany of Cocos Island', *Proceedings of the California Academy of Science*, series IV, vol. I, p. 375 (San Francisco, 1912).

Galápagos

A great deal has been written about these islands, but there is no good general account of them. Among the more useful works are the following:

C. Darwin, *Journal of Researches into the Natural History and Geology of the Countries Visited during the Voyage of H.M.S. Beagle round the World, under the Command of Captain FitzRoy, R.N.* (London, 1842). This is easily accessible in the World's Classics series and other cheap editions.

A. Stewart, 'Botanical conditions in the Galápagos', *Transactions of the Wisconsin Academy of Science*, vol. XVIII, p. 272 (Madison, 1915). This gives information about coasts.

Dora Strauch, *Satan Came to Eden* (London, 1935). This gives a personal account of life on one of the islands, and is said to be a true picture.

L. J. Chubb, 'Geology of Galápagos, Cocos and Easter Islands', *Bernice P. Bishop Museum Bulletin*, no. 110 (Honolulu, 1933).

Juan Fernández

C. Skottsberg, 'The islands of Juan Fernández', *Geographical Review*, vol. V, pp. 363–83 (New York, 1918), is a good general account with notes on the vegetation.

Easter Island

A good general account is given by Mrs Scoresby Routledge, *The Mystery of Easter Island* (London, 1920). Some general information is also given by R. W. Robson (editor), *Pacific Islands Year-Book* (Sydney, 1939).

The geography and geology are covered by L. J. Chubb, 'Geology of Galápagos, Cocos and Easter Islands', *Bernice P. Bishop Museum Bulletin*, no. 110 (Honolulu, 1933) and M. C. Bandy, 'Easter Island', *Bulletin of the Geological Society of America*, vol. XLVIII (New York, 1937). The population and archaeology are dealt with in detail by A. Métraux, 'Ethnology of Easter Island', *Bernice P. Bishop Museum Bulletin*, no. 160 (Honolulu, 1940) and H. Lavachery, *Ile de Pâques* (Paris, 1935).

Pitcairn

A very good general account of the island, its people and their history is given by H. L. Schapiro, *The Heritage of the Bounty* (London, 1936)—as a result of the visit

of the Templeton Crocker expedition in the yacht *Zaca* in 1934. A brief description, with a list of the chief magistrates since the inception of the office, is contained in the *Pacific Islands Year-Book* (Wartime edition, Sydney, 1942). The recent reorganized regulations for the government of the colony are given in the *Western Pacific High Commission Gazette*, no. 54 (Suva, 29 December 1941). General information is also contained in a report by R. T. Simons, *Colonial Reports Miscellaneous*, No. 30, Pitcairn Island, Cd. 2397 (London, 1905) and in *Pitcairn Island General Administration Report and Medical Report*, C.O. 155 (London, 1938).

Older works which contain much useful detail are by T. B. Murray, *Pitcairn: The Island, the People and the Pastor* (3rd ed. London, 1854), and W. Brodie, *Pitcairn's Island and the Islanders in 1850* (London, 1851). Much information on the history of the island community is given by C. P. Lucas, *The Pitcairn Island Register Book* (London, 1929).

Chapter III

THE SOCIETY ISLANDS AND ASSOCIATED GROUPS

(FRENCH OCEANIA)

Physical Geography: History: The People: Administration: Social Services: Economics: Communications: Bibliographical Note

The Society islands and the groups of islands immediately to the north-east, east and south of them comprise the political area known as the French Establishments in Oceania, or briefly, French Oceania. This territory does not, as might be expected from the title, include all French possessions in the Pacific. The name of *Établissements Français de l'Océanie* is used for administrative purposes to apply to those island groups administered as a colony of France which lie south of the equator and east of long. 155° W. They comprise the Society islands (both Windward and Leeward groups), the Tuamotu archipelago, the Austral islands, the Mangareva group and the Marquesas islands. Most of the islands are small, and all are administered from Papeete, in the Society islands. (Fig. 28 shows their dispersion by projecting them on a map of Europe.)

The area and population of the various groups are as follows, in approximate figures:

French Oceania: Area and Population

Island group	Land area sq. miles	Population
Society islands	593	30,950
Tuamotu archipelago	319	6,578
Austral islands	53	3,188
Mangareva group	11	579
Marquesas islands	459	2,400
Rapa and Marotiri	14	267
Total	1,449	43,962

Based on official and other sources. No complete survey of the islands has been made, and estimates of their total area vary between about 1,350 and 1,575 sq. miles. The official total usually given (without full details of individual islands) is 3,998 sq. km. (1,544 sq. miles), as in *Annuaire Statistique*, 54ème vol., 1938, p. 249 (Paris, 1939). The figures in the table represent a conservative compilation. The figure given for total population is that given by the census of 1936, but the figures for individual groups have been rearranged to conform to geographical and not administrative divisions. Clipperton, which now forms part of the jurisdiction of the Governor of the colony, is omitted from consideration here, since it has already been discussed in its more appropriate geographical context in Chapter II.

In view of the wide area covered by the colony and the differences in the various islands, details of their physical structure, coasts and anchorages, climate, people and resources are given as each group is examined in turn. This general review touches these points briefly, but gives greatest attention to the history, administration and economics of the colony as a whole.

PHYSICAL GEOGRAPHY

Types of Islands

In physical character the islands can be divided into two broad types, high and low.

The high islands comprise the Society group (with the exception of a few islets); the Marquesas; the Austral group (with the exception of Maria); the Mangareva group (with the exception of Temoe); Rapa and Marotiri, all of volcanic origin. Included among them also might be Makatea, in the Tuamotu group, though it is formed of upheaved coral, and is only of moderate elevation.

The low islands comprise practically all of the Tuamotu group—as their alternative name of the Low archipelago indicates—and the small islands mentioned above. These low islands are of coral formation, and mostly atolls. Nukutavake, Tikei and Tepoto (in the Disappointment islands), however, have no lagoons, though the last two have depressions which indicate an upraised atoll origin. For all practical purposes these few low islands can be considered together with the great array of the Tuamotu atolls, since owing to their lack of elevation and small size there are no significant differences in their vegetation and water supply.

The contrast between the high and the low islands is very marked. In the Society group and the Marquesas, in particular, the major islands rise to heights of several thousands of feet, and are very rugged, with sharp peaks, deep valleys and precipitous cliffs. They are well watered, with many streams, some of which in Tahiti are large enough to be termed rivers, and the soil, particularly on the narrow belt of low land round the coast, is very fertile. The vegetation is usually luxuriant, not only on the coastal belt, but also in the interior, where large forest trees and a variety of jungle plants are to be found. But some of the high land, particularly in the Mangareva group, where erosion has taken place to a marked degree, bears very little plant cover. Around the bases of these volcanic islands there

are often coral reefs, both of fringing and of barrier type. But in many parts, especially in the Marquesas, the growth of coral has been inhibited by the great depths to which the coastal cliffs fall away.

In the low islands of the Tuamotu group, on the other hand, there are no extensive land masses, and each island normally consists of a



Fig. 28. The French Establishments in Oceania, superimposed upon Europe, on Bonne's equal area projection

number of small land areas connected by an intricate system of reefs. They are often so low that in cyclones large portions of the surface are swept by seas. Fresh water is deficient; there are no streams, and the supply is obtained from wells and rainwater catchment. In some cases the inhabitants depend to a considerable extent upon the liquid from green coconuts. Vegetation is correspondingly scanty, the soil being mostly decomposed coral with only a little humus. Even where

plant life is most abundant the number of forms is very limited. Coconut, pandanus, hibiscus and other littoral types predominate, and the native agriculture is not highly developed. The extensive reef system renders navigation difficult, and, except where there are good channels into lagoons, anchorages for large vessels are inconvenient.

Harbours and Anchorages

The French Establishments in Oceania lie almost midway between Australia and the Panama Canal, and afford good ports of call. The best harbours are at Papeete and Port Phaeton, in Tahiti, Te Avanui in Borabora, and Ahurei bay in Rapa island. Good harbours suitable for large vessels also exist in several of the other Society islands, and tolerable ones at Raiurua in Raivavae, at Taiohae in Nukuhiva and at Taahuku bay in Hivaoa. There are also many anchorages throughout the various groups. Papeete, as the capital of the colony, is the only port with berthing for large vessels, but it is capable of much improvement (see p. 153).

Climate

Climatic conditions vary in the different groups owing to the considerable variation in their latitude and elevation. But in general the region is characterized by prevailing easterly trade winds for the greater part of the year, high and moderately uniform temperatures which rise gradually towards the end of the year, and maximum rainfall during the hottest months. Tropical cyclones are also liable to occur over most of the region, usually in the first three months of the year, on an average once a year.

A meteorological service, instituted in 1931, comprises a central observatory at Papeete and a number of subsidiary stations transmitting daily observations to it; two seismographs were installed in 1934.

HISTORY

Pre-European Conditions

The history of Tahiti and the other island groups, like that of the Pacific as a whole, is often conceived as having begun with their discovery by Europeans. But it must be realized that for many centuries before Europeans first penetrated into the Pacific, perhaps

early in the Christian era, most of these islands had been discovered and populated by brown-skinned people, for the most part ultimately of Asiatic origin. In the Eastern Pacific, especially, the ancestors of the present Polynesians had voyaged widely, had named most of the islands afterwards renamed by Europeans, and had already modified the native flora and fauna by their own introductions. Most of the collective names for island groups are of modern origin, but a large number of the names still retained for individual islands are those given to them by Polynesians.

The Polynesians had no system of writing before Europeans came, and their history was therefore preserved by oral tradition alone. But if only to give a basis for their system of rank and land tenure and to maintain the structure of their religion, they took pains to hand on these traditions in the form of genealogies and records of the more dramatic events of the past. This material has in many cases been written down by missionaries, by their native converts, and by anthropologists, and checked by archaeological investigation, so that to-day we are able to assemble at least an outline of the pre-European history of the major islands.

Though most of this historical material is on a small scale—consisting mainly of stories of the adventures of ancestors, local wars, and the emergence of different groups to power—it must be remembered that behind the present-day Polynesian inhabitants of the islands stretches a long period of occupation in which almost every island and even almost every hill, valley and stream has gathered its traditional associations, some of which are still full of meaning to the people. This is true of most of French Oceania.

The colony contains in the Society islands one of the cradles of Polynesian culture. In early times, approximately since the period of the Middle Ages in Europe, the Society islands were of great importance as a centre of diffusion; they had relations at various times with Hawaii, the Cook islands and New Zealand, as well as with the Tuamotu group. Raiatea in particular is notable as having been one of the starting points for ancestors of the Maori on the voyage to New Zealand about the fourteenth century. The island is famous too over a wide area of Polynesia as having been one of the most important centres of the ancient religious cults. Among the many temples (*marae*), that of Taputapuatea in Raiatea was one of the most sacred and renowned. According to tradition, Tahaa, adjacent to Raiatea, was the birthplace of Hiro, a celebrated Polynesian voyager and adventurer, though claims are also made for Raiatea as his place of

origin. Tahiti also had several famous temples, and the chiefs of Papara, in the south-east of the island, had the right to wear both the Red Girdle and the Yellow Girdle, two of the most sacred emblems of authority throughout the Society islands as a whole. Borabora, another of the islands, enjoyed prestige because its high chiefs had the right to wear the Yellow Girdle, and also because it was one of the primary seats of councils dealing with the genealogies of Society island chiefs. Here also was situated the noted temple of Vaiotaha.

Modern Political History

The modern history of the islands comprising the colony has its main focus in Tahiti.

Tahiti

Tahiti, the most important island in the Society group, was discovered in 1767 by Captain Wallis in H.M.S. *Dolphin* and named King George III's island. It was visited in the following year by Bougainville. And in 1769 Cook, in the bark *Endeavour*, arrived there with a group of scientists to observe the transit of Venus; he visited it again three times on his later voyages. The writings of these men made the island well known in Europe. From that time onward Tahiti had frequent contact with Europeans: in 1774 Spanish vessels from Peru landed two Roman Catholic priests and left them for about a year; in 1778–9 Bligh, in H.M.S. *Bounty*, spent over five months at the island, and later the mutineers returned there; and a number of other ships made calls during the same years.

Britain and France. A decisive change came in 1797 when the London Missionary Society established on the island the first Protestant mission station in the Pacific. Though the position of the missionaries was at first rather precarious, their presence made Matavai bay, where they had settled, the safest port in Polynesia. Whalers and traders began to call; at times considerable numbers of sailors were ashore for many months; and from about 1820 onwards a number of reputable traders settled on the island. But the influence of the missionaries remained supreme, and largely through them the rulers of Tahiti came to look on Great Britain as their protector. In 1836 they refused to allow French Roman Catholic missionaries to establish themselves on the island; and when this led, two years later, to a visit from the French frigate *Vénus*, Captain Du Petit-Thouars, and to the enforced signing of an unwelcome treaty, they

appealed to Queen Victoria for help. Four years later Du Petit-Thouars came again and forced Queen Pomare, sovereign chief of Tahiti, to accept a French protectorate. Great Britain had steadily refused to assume any formal responsibility towards Tahiti; but Queen Pomare and her followers remained confident that relief would come. The queen herself retired to Raiatea in the Leeward Islands; and in Tahiti there were armed uprisings. Hopes of British intervention were virtually destroyed when H.M.S. *Collingwood* saluted the protectorate flag in August 1845; but resistance continued for almost another year and a half. Then Pomare returned to Tahiti, where she lived until her death thirty years later, in 1877, still a queen in name but shorn of all but ceremonial authority. Three years after her death the island was formally annexed to France.

The Pomare Dynasty. The position of what is known as the Pomare dynasty needs some explanation. In pre-European times there was no supreme ruler of the various islands which formed the later Tahitian kingdom, nor even of Tahiti itself. In Tahiti, at the time it was discovered by Europeans, there were three great autonomous political divisions: Teva in the south, Oropaa in the west, and Aharoa in the north. Among the chiefs of these divisions the high chief of Teva was the individual of highest rank. But the majority of the early European visitors, from Wallis onwards, anchored at Matavai, in Aharoa; and, misled by the respect paid to its high chief by his own people, they believed him 'king' of all Tahiti.

The Aharoa division was itself composed of six districts of which one, Te Porionuu, had at this time established its ascendancy over the rest. At about the time of the island's discovery by Europeans there succeeded to the chieftainship of Porionuu, and so to the high-chieftainship of Aharoa, the chief Tu. During Cook's four visits to Matavai, Tu received the respect and the presents thought due to him in his supposed capacity of king of Tahiti. These marks of European favour created for him both new opportunities and new dangers: he could gain new allies, but he was certain of making new enemies among the less favoured. Wars resulted. Tu's fortunes were various. When Bligh arrived in 1788 he found the chief slowly recovering from a succession of severe defeats; but the presence of the *Bounty* and the effects of Bligh's gifts (which included two muskets) completely changed his position. He found new native allies and by 1790, helped further by the mutineers from the *Bounty*, he had defeated all his enemies. (It was apparently during this last series of wars that, after catching a cold and coughing at night, he had taken

the name Pomare (*po* meaning 'night' and *mare* 'cough'), by which the heads of the family were subsequently known.) In 1803 Tu, or Pomare, died and was succeeded by his son, as Pomare II.

After the missionaries had settled at Matavai in 1797 the Pomare family had begun to receive help from Europeans on an increasing scale: gifts were showered on them; and to these they added the even more substantial proceeds of organized trade. The results were immediate: the pretensions of the Pomare chiefs and the resentment of their rivals alike increased. For some years an uneasy peace was maintained. But in 1808 a final attempt to destroy Pomare II's growing power was made, and in 1809 he was forced to retire to Moorea, which remained his headquarters for the whole of the war. For seven years desultory fighting continued. During this period of disorder Pomare alone was trusted by Europeans because he, more than any other chief, had perceived the advantages of treating them fairly. Aided by their advice and their muskets, he finally attained victory in 1815. What had been won by the arts of war was consolidated by those of peace. Pomare had become a Christian during the later stages of the war; the general conversion of the people quickly followed his triumph. Churches and schools, missionary-inspired courts of law and missionary-advised experiments in large-scale trading all helped to place the new political order beyond dispute. The old rivalries had not been destroyed, but henceforth they found an outlet in efforts to control the government, not to destroy the kingdom. After 1815 the Pomare family reigned supreme over Tahiti, Moorea and their dependent islands; they had a shadowy suzerainty over the Tuamotu group; and they possessed alliances with the rulers of the neighbouring islands of Raiatea and Huahine, in the Leeward group.

Pomare II lived to enjoy his success for six years. He was succeeded at his death in 1821 by his infant son, as Pomare III. In 1827 the boy king died, and his sister Aimata, then a girl of thirteen, ascended the throne, to become Pomare IV. Queen Pomare, as she was popularly known, reigned for fifty years. Her son, Pomare V, who succeeded her in 1877, was induced to abdicate in 1880. With his death in 1891 the dynasty, from the official point of view, came to an end, though a descendant of the Pomare family, unrecognized by the French, is still regarded by the Tahitians as the head of a royal house.

The Tahitian Sphere of Influence

The Leeward islands, which had been discovered by Cook in 1769, had always possessed close contacts with Tahiti. Leeward islanders had assisted Pomare II in the war of 1808–15, and they had been among the small band of attentive pupils which had gathered round the missionaries in the critical years 1813–15, when Christianity was first obtaining converts. Between 1818 and 1822 European missionaries settled in the four principal islands of the group. Events in Tahiti in the preceding years, and contact with those of their countrymen who had listened to the missionaries, had made the people eager for teaching and for books; mass conversion followed quickly. From about 1820 to 1840 Tahiti and the three independent states of the Leeward islands—Huahine, Raiatea and Tahaa, and Borabora—all progressed in similar fashion under missionary tutelage. But they remained independent of one another; the old personal alliances between most of their rulers did not harden into a political confederation. When the French established a protectorate over Tahiti in 1842, however, they believed that all the Leeward islands were included in the cession. Their claim was resisted by force. In 1847 a joint declaration was signed by Great Britain and France recognizing their independence, and for another forty years the native governments remained in existence, conducting their own affairs, flying their own flags, and accepting as their principal advisers English Protestant missionaries. But the protectorate and the native states were too close to one another for such divergent systems of government to function smoothly side by side. Disaffected Tahitians sought refuge in the Leeward islands and Leeward islands intrigues were hatched in Tahiti. Finally, after Great Britain had agreed to the abrogation of the 1847 convention, France annexed the group in 1888; and the whole of the Society islands thus became part of the French colony.

The Tuamotu archipelago was discovered piecemeal by European navigators over a period of more than two centuries. Several of its islands were seen by Quiros in 1606. Others remained unknown until well after the establishment of the pearling industry in the nineteenth century. The Pomare family of Tahiti, themselves of Tuamotu ancestry on the father's side, obtained a form of suzerainty over the group, which became known as the Paumotu (Submissive islands). In the reign of Pomare IV this began to be spoken of as 'sovereignty', so that the French regarded the group as included within the pro-

tectorate of Tahiti in 1842. The islands were annexed, along with Tahiti, in 1880; and at the request of the natives they were renamed the Tuamotu (Low) group.

Tubuai and Raivavae in the Austral group, which were also considered by the French to form part of the dominions of Pomare, were annexed at the same time. The other Austral islands, Rurutu, Rimatara and Hull, were placed under French sovereignty a little later, while Rapa, over which a French protectorate had been declared in 1867, was annexed in 1881.

Other Island Groups

In the comparatively remote Mangareva and Marquesas islands the establishment of European influence was largely unconnected with the course of events in Tahiti.

The people of the Mangareva group, which in 1834 became the headquarters in Polynesia of the Roman Catholic Society of Picpus, requested French protection in 1844. It was provisionally granted by a visiting naval officer, but the French government decided to take no further steps. As the years passed the missionaries, who had at first been eager for French intervention, wished increasingly to retain their power. Periodic attempts at interference by French officials were firmly resisted. By 1870 this quarrel between the representatives of Church and State had become so notorious that the French government decided upon an investigation. As a result of it the protectorate was formally confirmed in 1871, and the group was annexed ten years later.

The contact of the Marquesans with civilization can be divided into two periods: that of the early European visits, from 1595 to 1842; and that of the French occupation from 1842 onwards.

The south-east islands of the group were discovered by Mendaña in 1595, and named by him 'Las Marquesas de Mendoza', after his friend the Viceroy of Peru. They were not seen again by Europeans for nearly two hundred years. In 1774 the group was again discovered by Cook. In 1791 the American trader Ingraham discovered Uapou, Nukuhiva and Uahuka. In the same year Marchand, in the *Solide* of Lyons, took possession of Uapou for France; twenty-two years later another American, Commodore Porter, arriving with prizes taken in the war with England, established a temporary settlement on Nukuhiva and raised the American flag there. From 1790 onwards, whaling and trading vessels visited the islands in considerable numbers for refreshment; and between about 1812 and 1816

a number of ships came for sandalwood. But regular commerce on any significant scale failed to develop: relations between Europeans and the Marquesans remained precarious. The history of early missionary efforts in the group is even less happy. The London Missionary Society left a man on Tahuata in 1797; a year later an American ship found him there, stripped of all his possessions and dressed in native clothing. Thirty-five years were to pass before the Society's missionaries in Tahiti were convinced that the time had come to make another attempt to settle European teachers in the group. In 1838, four years after the re-establishment of the Protestant mission, Roman Catholics finally succeeded in settling there, but for some time their presence achieved little beyond the stimulation of further wars and intrigues.

In 1842 the islands were annexed to France by Du Petit-Thouars, then Admiral, acting on instructions from his home government. France hoped to find a base for her naval forces, a port at which her whalers and traders could obtain supplies, and a site for a penal colony. But once again the Marquesas disappointed those who had formed high expectations in regard to them. The acquisition of Tahiti in the same year, however, supplied the first two needs; and the annexation of New Caledonia eleven years later supplied the third. Consequently, it was long expected that the French would abandon this unprofitable possession. Twice during the first seventeen years the military forces of occupation were withdrawn; and until the reorganization of French administration in the Eastern Pacific after the formal annexation of Tahiti in 1880, little progress was made in the establishment of law and order. Drunkenness, prostitution, murder, human sacrifice, cannibalism and warfare thrived, despite all the efforts of the administration and the missionaries. Diseases spread and the population declined.

After the establishment of a civil administration in 1881 conditions began to improve. But the introduction of opium about this time—intended for Chinese plantation labourers—further sapped the vitality of the people: its use was not officially suppressed until 1894.

THE PEOPLE

The population of French Oceania is of moderate size by Pacific standards, comprising less than 45,000 people according to the last census in 1936, with an average density of about 30 inhabitants per sq. mile. The majority of the people are Polynesian or part-Poly-

nesian, forming about 85 % of the total; about 10 % of the total are Chinese and about 3 % European and American. No detailed recent figures of sex and age distribution are available, but in 1931 the proportion of males to females was 54 % to 46 %. Males above the age of 14 years represented 35 % of the total population, females above the same age 28 %, while children of both sexes under 14 years represented 37 %.

Population Change

The total population of the colony has increased fairly steadily in the last forty years, as follows:

1902	29,454	1926	35,862
1907	30,563	1931	39,713
1911	31,447	1936	43,962
1921	29,603		

The proportion of the different elements in the population has varied in this period, though exact measurement of relative change is not possible owing to changes in the method of classification and to the absence of special categories for the offspring of mixed marriages. But it seems evident that the decline of the native population, which was a marked feature of the nineteenth century, has been arrested in most of the island groups except perhaps the Marquesas.

Taking the colony as a whole, the native population in 1911 appears to have been approximately 26,000. In 1931 it was 29,101, including 777 other Polynesians from outside the area. By 1936 there was a native population of possibly 32,000. But these figures conceal the extent of miscegenation. Some of the Polynesians have an admixture of French or Chinese blood, while the majority of the people classed at one period as French were part-Polynesian. In 1926, for instance, there were 870 (white) French, and in 1931, with no appreciable immigration in the interim, the numbers of 'French' were given as 5,280. Of these probably less than 1,000 were white. In the census of 1936 no complete separation of the 'French' was made; the figures for Papeete grouped together white French, mixed bloods and Polynesians. The effective tendency is thus to block any creation of a separate mixed-blood class. But in terms of Polynesian affinities, the number of natives and part-natives may be put at about 33,400 in 1931 and 37,300 in 1936.

Among Asiatics, the Indo-Chinese and Japanese had decreased to just over 100 in 1936. But the Chinese had increased consider-

ably, from 975 in the colony in 1911 to about 4,000 in 1931 and to 4,569 in 1936.

Europeans and Asiatics

French influence and culture are dominant among the Europeans, and have spread to a considerable extent through the native population, especially in Papeete, where there is a large admixture of French blood. But other European and American elements are also represented, and British firms have long played an important part in commerce. In the 1936 census there were 401 British and Americans in the area, and 209 others of white blood apart from the French.

Of the Asiatics present in the colony, the few Japanese and Indo-Chinese are mostly labourers employed at the phosphate works on the island of Makatea, while the Chinese are engaged in a variety of occupations, mainly in Tahiti. Penetration of Chinese through the economic life of French Oceania is considerable, and increasing. But in terms of population they are not overrunning the colony to the extent sometimes depicted. Almost all are from the southern provinces of China. Originally entering as labourers, they have gained their present position by their industry and frugality. In almost every island and atoll the local stores are kept by Chinese; and since they frequently act as moneylenders, or supply goods on credit, very many of the natives are heavily in debt to them. Chinese have also reclaimed swamp areas in Tahiti and Moorea and introduced rice cultivation into the colony. They also control the growing of vegetables for the Papeete market. Import business in the colony is largely in their hands, as well as the small industries such as baking, butchering, laundrywork and small restaurant keeping. There are two hundred Chinese shops in Papeete alone dealing in general merchandise, as against three or four French. They maintain their own schools, clubs, and philanthropic organizations. Chinese storekeepers pay higher licence fees for trading than Europeans do, and are subject to other special conditions. The offspring of Chinese families born in the colony formerly had the privilege of obtaining French citizenship by means of a simple declaration, but by a recent decree they must now observe the regular formalities of naturalization in precisely the same way as any adult foreigner. Marriages between Chinese and Polynesians are few, but temporary alliances are formed, though not so commonly as often supposed.

Polynesians

In physical appearance the native people of French Oceania conform to the recognized Polynesian type. They are tall, with light brown skin and dark wavy hair. They have regular features, well-moulded limbs, broad faces and full lips (Plates 21, 22). The languages are all dialects of the Polynesian group, the most widespread being that of Tahiti. The majority of the people still use only the vernacular. French is understood and spoken by a number of natives, especially in Tahiti, but it is not widespread. In culture the people follow a general pattern. In religion they are now all Christian, the ancient forms of ritual and belief having been abandoned for the greater part of a century. In their economic life they are largely self-supporting, with concentration on simple forms of agriculture and fishing, and in all the islands the coconut is one of the staple items in their economy. (Further details are given for each island group later.)

ADMINISTRATION

Central Government of the Colony

The French Establishments in Oceania are administered by a Governor, assisted by a Privy Council consisting of eight official and nominated members. Economic and budgetary matters are supervised in the first instance by a representative body known as the Economic and Financial Delegations. This consists of six nominated members: the Mayor of Papeete, the Presidents of the Chambers of Commerce and of Agriculture and the administrators of the Leeward group, the Gambier division and the Marquesas; and seven elected members—a municipal councillor of Papeete, a member each of the Chambers of Commerce and Agriculture, a member of the Municipal Commission of Uturoa, and a member of each of the district councils of Tahiti, Moorea and the Tuamotu group. By reason of the dispersion of the islands and the difficulty of communications, a permanent committee of five members was set up in 1938 by the Minister of Colonies from among this body to discuss supplementary expenditure after the closure of the session of the Economic and Financial Delegations each year. This committee is composed of members ordinarily resident in or near Papeete.

The creation of the Economic and Financial Delegations was a reform introduced in 1932, to meet the growing need of the colony for expression of local opinion in public affairs. Since 1903, when a



Plate 21



Plate 22

Facial types commonly met among Polynesians of French Oceania
The woman is of Amanu, Tuamotu archipelago; the man is of Rapa.



Plate 23. Polynesian spearing fish

The man is wearing the usual calico print kilt, tucked up round his waist for work. His canoe is of the modern Tahitian type, with nearly straight stem and outrigger float connected to the hull by two booms, of which the after one is slender and pliable. The fish spear has points of iron rod or wire.



Plate 24. Drying vanilla, Society islands

The pods are exposed to sun and air on a low wooden and mat frame. The building, of a common native type, with bamboo walls and thatch roof, is standing among breadfruit trees.

former General Council was suppressed, the only official channel for local views had been the Council of Administration, a purely consultative body comprising seven members of whom four were officials and the others represented the municipality of Papeete and the Chambers of Commerce and of Agriculture. This was enlarged in 1930 to twenty members, but still gave no adequate voice in affairs to the non-official body. Even the reforms of 1932 have been criticized on the ground that the governor of the colony still has centralized in his hands all the major powers, including those over fiscal and budgetary matters, which in reality he arranges by an arbitrary act of authority, and that neither colonists nor natives have any truly representative and decisive voice in these fundamental concerns. The colony does not elect a Deputy to the French Chamber, but is represented on the Superior Colonial Council (*Conseil Supérieur de la France d'Outremer*) by a delegate elected for four years by all French citizens of 21 years of age and over, who have been resident in the colony for six months. It appears to have been a practice to choose as delegate a Deputy, thus securing in effect some parliamentary representation.

The more detailed administration of the colony has suffered from difficulties of communication between the scattered island groups. Each major group, such as the Leeward islands, the Marquesas, and the Tuamotu archipelago, is in charge of an administrator, but in some cases at least the officials concerned have sometimes found it more convenient to reside in Tahiti and make periodic tours to their divisions. Representation of the central government has therefore tended to fall largely into the hands of the French gendarme living on each island or major island of a group.

Political Status of Polynesians

The position of the native Polynesians in the political and administrative system is in some respects anomalous. When in 1880 Pomare V, ruler of Tahiti, ceded those island groups which in theory at least formed part of his kingdom, this gave to the inhabitants the status of French *citizens*, according to a somewhat complicated French rule. By the census of 1931 there were 16,998 such native French citizens out of a total of 29,101 natives, and out of a total of 22,278 French citizens of all types, including those of European blood. In the other island groups the Polynesians have acquired only the status of *subjects* of France, though they belong to the same physical and cultural stock, and have close relations with their more privileged

neighbours. Moreover, in theory these Oceanic French citizens should enjoy rights equal to the citizens of metropolitan France, in matters of legislation and parliamentary government. But in practice they are governed by a system of laws codified from a mixture of customary native rules, administrative practices and French civil law. This system, while differing in detail from that by which the French subjects are controlled under the authority of the governor, is productive of as little real freedom. A decree of 1932, modifying an earlier one of 1921, lays down conditions in which an Oceanic subject of France may become a French citizen.

Local Government

In local government, again, there is considerable variation. Papeete is controlled by a municipal council, Uturoa in Raiatea has a municipal commission, while elsewhere there are district councils. Only the first-named is effectively representative. The degree of control exercised by native leaders also varies to a considerable extent. In Tahiti and the Marquesas the policy of assimilation was early applied. The power of the chiefs received no adequate recognition and was not allowed to vie with that of the government officials; native confederacies were crushed, and elaborate regulations were set up, often with no continuity of policy. In the Leeward islands and the Tuamotu group, on the other hand, a policy of more indirect rule was allowed to evolve and native institutions have been treated with more toleration. In the Leeward islands the native custom has been to a large extent codified. In the Tuamotu and Mangareva groups also the chiefs have been invested with the functions of civil officials. The district councils in addition to regulating village affairs, etc. have jurisdiction over land disputes between natives. Each council is composed of seven members, and its president is a minor administrative official. In those islands where the inhabitants are French citizens they elect their own district councils; in those where the inhabitants are subjects of France the councils are appointed by the Governor of the colony. In many cases, however, the local French gendarme is the effective agent of government.

Legal System

The system of justice in the colony is directed by a Procureur de la République with the title of *Chef du Service judiciare*. Magistrates in the various districts of the colony hold courts, travelling from one island to another by schooner. At Papeete there is a Court of First

Instance, a Commercial Court and a High Court filling the role of a Court of Appeal. The same system of law is in operation for Europeans, Asiatics and natives.

Land policy

The land policy still leaves scope for adjustment to modern conditions. In general the French government expropriated much vacant and rebel territory, though a great amount of the land is still in native hands. But there is much litigation over land ownership, and the difficulty of obtaining a valid title to native land has served to deter settlement. Complaint is made that natives are often opposed to the sale or lease of lands not occupied by them, but it is not often realized that ancestral rights and sentiment account for this to a large extent, and the lack of a settled land policy on the part of the government has not clarified the situation.

Soon after the French took possession of the islands an attempt at settling native titles was made. Families claiming ownership were required to state the names and measurements of their lands; these were then published officially, and if no objection was raised during the time prescribed by law the claimants were adjudged the legal owners of the freehold and future claims were barred. This settlement process is still by no means complete in many of the islands, but is being pursued by the topographic service of the government.

Lands which have been sold at auction as the result of judicial proceedings in the High Court acquire a title against which no future attack may be made, and lands which have been in European ownership for a long period, or which have changed hands frequently by means of notarial deeds, without opposition, may be regarded as having a good title. A Ministerial Decree of 1932, modified in 1934, now regulates all transactions in real estate throughout French Oceania, and by requiring the sanction of the Governor of the colony operates as a safeguard to native interests. Building land in Tahiti and Moorea, particularly, may have a high price, but in the remoter islands the value, if indeed it may be purchased at all, is generally governed in terms of its coconut capacity. Since the economic depression, however, lands which have no residential potentialities have little market value, though the owners as a rule are very reluctant to sell. Normally a native property has a number of owners, with undivided shares.

Finance

Financially, the colony has been on the whole self-supporting, but a deficit of some 7 million francs was incurred during the 1931 depression and immediately afterwards; most of this was wiped out by a subvention from the French government. In 1934 the colony was authorized to raise a loan of 15 million francs, but this was not taken up because of the charges that would be incurred in interest and amortization. By 1935, however, the colony had begun again to build up its reserves, which amounted in 1938 to 9 million francs. The budget in 1939 comprised a total revenue and expenditure of 27,560,000 francs. The bulk of the administrative revenue is raised by import duties, and direct taxation is comparatively light. In 1939 the collections by the Customs service comprised a total of nearly 17 million francs, of which about 4½ million was derived from the *octroi de mer*, about the same amount from customs duties, about 3 million from import taxes, and nearly 2 millions from taxes on the consumption of alcohol and tobacco, and from export taxes, respectively. These receipts were altogether about 5 million francs in excess of the estimate.

SOCIAL SERVICES

Social services are fairly well developed in Tahiti, but still imperfect in many of the other islands.

In general the islands are healthy, and there is no malaria. But the native people suffer to some extent from tuberculosis, and filariasis occurs, including that form of it known as elephantiasis. The filaria is transmitted by mosquitoes, and it is therefore advisable to sleep under a net. Leprosy also occurs, though it is not very common. Poverty of communications has restricted the development of medical services, and the tendency has been to rely largely on a medical personnel drawn from military sources, and to concentrate the services primarily in Papeete. In Papeete there is a hospital and provision for maternity cases, and auxiliary hospitals are at Taravao (Tahiti), Uturoa (Raiatea) and Taiohae (Marquesas). A leper settlement at Orofara had in 1940 ninety-five patients, including a number from Rapa. Other leper settlements have been founded in the Marquesas and at Reao in the Tuamotu group.

Education is compulsory throughout the colony. There are some government schools, but most of the instruction, which is all of the primary grade, is undertaken by religious schools, both

Catholic and Protestant, which receive assistance from government or municipal funds. There is also a Chinese school in Papeete. In 1935 there were eighty-seven primary schools, with about 180 teachers and 7,200 scholars in the whole colony. Since then, partly owing to the growing population of school age, there has been some expansion.

Other government activities include an agricultural service. This, reconstituted in 1938, now comprises four stations, studying the cultivation of cinchona, rotenone plants, *arabica* coffee, potatoes, oranges, etc. In 1938 also a large programme of development in the demographic and economic field was set out by the governor and approved by the Economic and Financial Delegations; some progress was made in various sections of this in 1939, but it had to be virtually suspended on the outbreak of the war.

ECONOMICS

There are no mineral resources yielding metals in the Establishments in Oceania. Though phosphates, produced from Makatea, and pearl shell, from the Tuamotu and Mangareva groups, are important, the wealth of the colony, which is not very great, lies primarily in its agricultural products. Industrial development in the colony is practically negligible, in spite of efforts made to establish factories to deal with cotton, sugar, and the by-products of coconut, and a few small shipyards which build for the local trade. One of the latest attempts is to found an industry for canning pineapples and extracting pineapple juice; this had a small but promising export in 1939.

AGRICULTURE

Copra.

Copra was by far the major item of agricultural production in the nineteenth century, and still is the most important. It is prepared in most of the islands, a considerable proportion being due to the work of the natives themselves in their own plantations. The quantity produced annually has practically doubled during the last twenty years, but the value of the export has not moved in parallel fashion, owing first to external changes in the value of the franc, which inflated the prices received, and later to the heavy fall in its price which began in 1930 and persisted till about 1935. It is noteworthy, however, that during the depression there was a fairly steep rise in production (see

Fig. 29). This is to be attributed partly to the institution of a special tax in the mother country (to which much of the export went) from which the proceeds were set aside to assist the industry; and partly, one may infer, to the desire of native producers to maintain their cash incomes in the absence of alternative forms of production. Before

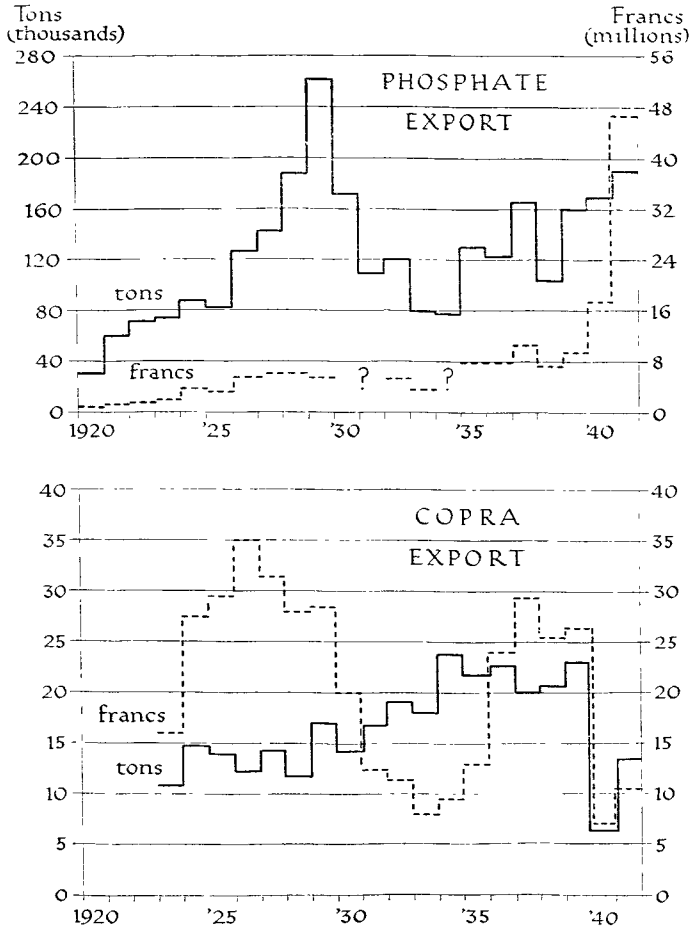


Fig. 29. French Establishments in Oceania: export of phosphate 1920–42, and of copra 1923–42

Quantities in metric tons. Based on: (1) *L'Océanie Française* (Paris, 1923–40); (2) *Pacific Islands Year-Book*, wartime ed. (Sydney, 1942); (3) *Annuaire Statistique*, 54eme vol. 1938 (Paris, 1939); (4) *Didot-Bottin*, tome III, p. 6028 (Paris, 1934); (5) *Statistical Yearbook of the League of Nations*, 1926–1938/9 (Geneva); (6) Services des Douanes, Etablissements Français de l'Océanie, *Statistiques*, 1939 (Papeete); (7) other official sources.

1934 about 20 % of the total copra export went to the United States, but the imposition by that country of a tax of 5 cents per lb. of oil contained in the raw material imported from foreign sources stopped the French Oceanic trade. Since 1934 practically all the copra of the colony has been taken by France, transported until the present war by vessels of the Messageries Maritimes. Hindrances to further development of the copra industry have been want of adequate labour supply, pests such as the rhinoceros beetle and the rat,* and the high cost of freight abroad. Attempts have been made to improve the position of the industry by finding commercial uses for coconut fibre and for the shells of the coconut, but they have not yet been developed to any extent.

Vanilla (Fig. 30)

The growing of vanilla has been an important industry in the high islands of the colony in the present century, especially in Tahiti, the Marquesas, the Leeward islands, and Rurutu in the Austral group. It was introduced by Admiral Hamelin in 1846. A considerable and fairly steady increase in the price of the product has taken place since 1934, and between 1937 and 1939 the value of the export has taken second place to that of copra in the trade of the colony. Production is to a considerable extent in native hands, though there are a number of European plantations; most of the marketing of the crop is done by Chinese. For some years the quality of the product was poor owing to inefficient preparation, but in recent years official measures of control over the gathering and airing of it have done much to improve the position. Rather more than half the export goes to France, but the United States, Australia and until recently Germany also have taken considerable quantities.

Coffee

In a number of the islands the cultivation of coffee has been undertaken on some scale, and hopes have been entertained that it would provide an important article of export. For a time the industry was assisted by a special tax imposed on imports of all foreign coffee into the mother country, the results of the tax being distributed among the colonial planters. Between 1935 and 1938 the export of coffee from the colony rose from 16 to 75 tons in response. The suppression of this fiscal help by France, however, led to the abandonment of

* In 1925 it was estimated that rat damage reduced the coconut crop by about 33 % in some islands.

numerous plantations, and the export of coffee fell to only 22 tons in 1939. The varieties cultivated are of hybrid origin, the dominating type being closer to *arabica* than to any other. They appear to be resistant to disease and very productive. Scarcity of good labour is one factor hindering development.

Cotton

At various times in the history of the colony attempts have been made to promote the growing of cotton. As early as 1821 a cotton field had been started and machinery for a cotton industry imported into Moorea by the London Missionary Society. There was some initial success, and native-grown thread was spun and carded. But the experiment then failed in the disturbed economic and social conditions. Later tests showed that both climate and soil were suited to cotton, and at times in the latter half of the nineteenth century as much as 3,000 tons of cotton were produced in a year. But the industry has not continued to develop, partly owing to insufficient labour, and the amount now produced is negligible. There are two ginning factories, at Papeete and at Uturoa on Raiatea, owned by the Société Cotonnière Française.

Sugar

Sugar plantations have also failed to develop to any large extent. In 1818 the London Missionary Society sent out a skilled sugar planter, who began work on Moorea on land provided by Pomare, the native king. But the experiment was stopped, mainly owing to a lack of native labour and allegedly to a distrust by Pomare of its possible effects on the economic life of the people. In 1839, however, there was at least one native plantation producing 5 tons of sugar a year, and total annual production in Tahiti and Moorea about this time was probably between 120 and 150 tons. Most of this sugar was obtained from the wild cane, which was cut by the Tahitians and brought to one or other of the small mills owned by European settlers. In later years the sugar industry tended to grow, but was practically killed by the more effective competition of Mauritius, Queensland and Fiji. In 1934, 304 tons of sugar were exported, and 271 tons in 1935, all to France. The export has since declined. A small amount of rum is manufactured locally—between 1935 and 1938 an average of 120 hectolitres were exported, but the average value was less than 100,000 francs.

Other Agricultural Products

Agricultural production of other types, apart from that of native foods, is on a small scale. Cultivation of European cereals near the coast is prevented by the climate, and at an altitude of 2,000–2,500 ft. in the interior of the larger islands, where it might be possible, there is insufficient level ground. Rice grows well in Tahiti, and is cultivated to some extent by Chinese, but its development is restricted by the competition of imported rice from Burma and China. Maize is also cultivated, especially by Chinese, and is of good quality, while many European vegetables are grown for the local market. Some, such as beetroot, flourish, but the stock degenerates if replenished only from seed grown locally. The vine grows well, but the fruit is poor; no wine is made in the colony. Oranges and other citrus fruits are cultivated, and a small quantity is exported. But the fears of the local fruit growers in the United States, Australia and New Zealand, and relative lack of care in grading and packing the product have hampered development of these countries as export markets for citrus and tropical fruits. Tobacco flourishes, but a crude native type alone is cultivated. Experiments in the growing of the castor-oil plant have shown that it has little commercial possibilities, and though those with sisal have been more promising there has been no development of the industry.

Among native food stuffs, breadfruit, taro and manioc take a prominent place.

Livestock

There are about 3,000 horses in the colony, some running wild in the Marquesas, and about 10,000 cattle, mostly in Tahiti and the Marquesas. The cattle, which are crossings of various strains, are utilized primarily for local consumption as beef. Apart from Papeete, where there is a dairy herd of about forty head, there is no use made of their milk, and neither butter nor cheese is made. There are some sheep, but no serious attempt has been made to develop any industry in them; lack of refrigeration space for transport of mutton is one of several difficulties. Goats are numerous on the high islands, and in some cases have multiplied so greatly as to be an embarrassment to agriculture. Pigs are kept by most of the native families, but on a small scale, and for local consumption; the same is the case with fowls, though turkeys are exported from some of the islands to Papeete.

Forest Products

Despite the fact that considerable areas of the Society islands are covered in forest, there has been little development of the timber resources. A few small items such as fungus, beeswax and bamboos are exported, but their value has tended to decrease in recent years.

Labour

It is obvious that one of the main difficulties in agriculture is shortage of labour, and its relative expense. (In 1936 the daily wage for agricultural work in Tahiti was 10 francs.) The importation of Chinese and Indo-Chinese labour has been attempted upon a small scale in some of the islands, but has failed to achieve the end desired, especially since, in the case of the Chinese, work as labourers has soon been abandoned in favour of engaging in more lucrative petty trade. It has been estimated that less than 2 % of the total cultivable area in the colony is under crops.

Pearl Fishing

The pearl fishing industry, which is carried on in the lagoons of the Tuamotu and the Mangareva groups, was until recently of considerable importance. It is open only to French citizens and subjects, and owing to threatened exhaustion by indiscriminate diving and the employment of machinery, it is now controlled by regulations. These prohibit the use of diving suits, lay down the minimum size of pearl oyster that may be taken, and establish a rotation of seasons for exploitation of the various beds. Each lagoon is divided into three or four sections, only one section being thrown open each season, and in some cases the maximum amount of shell that may be extracted is fixed. These measures have taken effect to some extent, and the export of pearl shell, which was at a very low level from 1930 to 1934, has tended to recover slightly (Fig. 30). But it is doubtful if the fisheries can for a long time regain the position they held earlier. The majority of the export during the last five years has gone to the United States, with France and occasionally Germany and Britain taking the remainder. Most of the shell in the northern lagoons of the Tuamotu group is black-bordered, and this is not desired on the French market; that of the southern lagoons and of the Mangareva group has a lighter border. The commercial importance of the fisheries lies almost wholly in the production of pearl shell; pearls are infrequent and secured by

chance, and their value is small by comparison. In 1935, for example, the value of pearls exported was only 59,000 francs against an export of shell of 723,000 francs, and this is a common proportion.

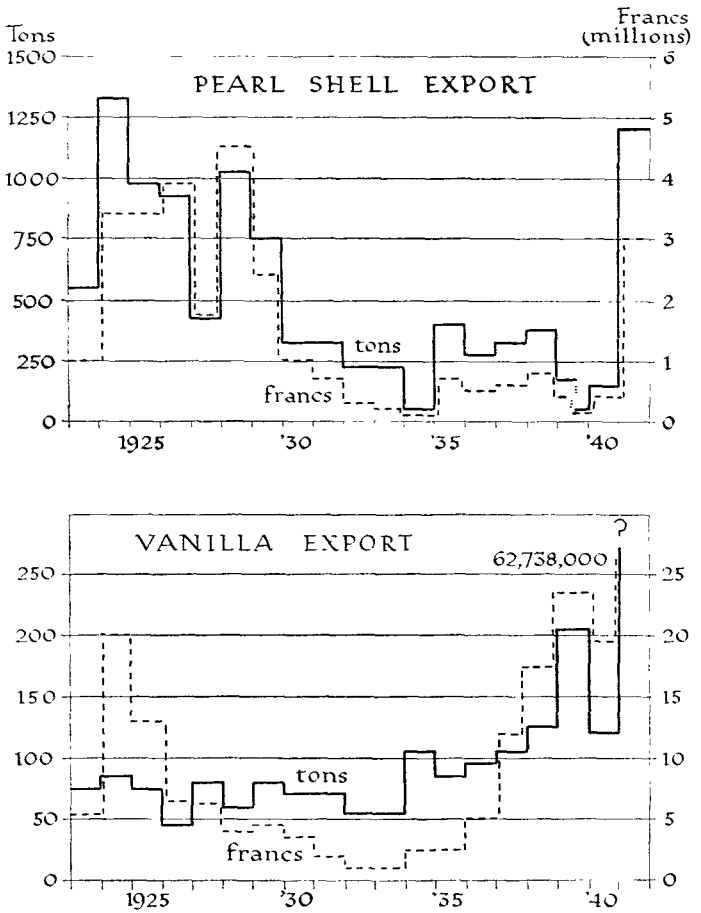


Fig. 30. French Establishments in Oceania: export of pearl shell and of vanilla, 1923–42

Quantities in metric tons. Based on: (1) *L'Océanie Française* (Paris, 1923–40); (2) *Pacific Islands Year-Book*, wartime ed. (Sydney, 1942).

Phosphate (Fig. 29)

A most valuable contribution to the trading economy of French Oceania was made by the discovery of phosphate on Makatea. By 1914 the average annual value of the export was in the region of

1½ million francs, with a production of about 80,000 tons a year. Since then, though development was interrupted by the depression, both output and value of the product have tended to increase considerably, and over the period 1935–9 the quantity exported has averaged nearly 140,000 tons per annum, with an average annual value of about 8¾ million francs. The majority of the export in recent years has gone to Japan. The growing demands of her agriculture stimulated production, though there was a set-back in 1938, when Japan imported only 90,600 tons of Makatea phosphate as against her import of 135,430 tons in 1937. This was attributed to the repercussions of the Sino-Japanese war, and also possibly to the intensification of Japanese production in her Micronesian mandated islands. But the Japanese import of Makatea phosphate recovered to 136,760 tons in 1939. Australia, New Zealand and Hawaii have also imported the product—in 1932 when Japan took 39,000 tons Australia took 26,000 tons, New Zealand 7,000 tons and Hawaii 6,400 tons of phosphate from the colony. But these countries normally offer a much smaller and more irregular market than Japan has done to the Makatea product.

Commerce

The native inhabitants of the colony supply most of their own food requirements, but in the almost entire absence of any local manufactures their demands for clothing, metal goods and other wares have to be satisfied from outside. The European section of the population imports nearly all that it requires, not only in textiles, metal goods and oil, but also timber, wines, and a variety of foods such as flour, biscuits, butter, sugar and preserved meat. Wines, some cloth and some metal goods come from France; from the United States, on balance the principal supplier in value, come mineral oils, tools, machinery, timber and tobacco. Australia supplies primarily flour and other grain products; New Zealand supplies condensed milk, butter and preserved meat; China supplies rice, sugar, cotton and other textiles; and Great Britain coal and some manufactured goods.

The Growth of Trade

Tahiti and the Society islands generally first developed commercially about 1820. At this time Europeans began to settle in the islands as traders. A number of the new settlers were members of missionary families or connected with them by marriage. These

personal ties brought them together as a group in business as well as in social matters.

With the coming of the French in 1842, this group did not lose its identity. Instead, it was drawn more closely together by the bonds of nationality. As Pacific trade increased, other traders settled in Tahiti, entered into commercial alliances with the older settlers and often married into their families. Though of various religions, the newcomers gave fairly solid support to the English Protestant missionaries in their conflict with the French authorities, and in general they tended to cling together. Even about 1860, after twenty years or more of French control, English families formed the major part of the unofficial European community in Tahiti and dominated much of its trade.

But the beginnings of what in some respects was to become a rival group are also to be found at an early date. In 1829, J.-A. Moerenhout, a Belgian, settled at Papeete. About seven years later he first stood forth as a champion of Roman Catholicism and then as an advocate of French intervention. Chiefs and settlers who were dissatisfied with the existing regime supported him, and after the establishment of a French protectorate they reaped their reward.

All these traders had broadly similar interests. They collected pearl shell from the Tuamotu group; coconut oil from the Leeward islands, the Australs, Samoa, the Cook islands, the Tuamotu group and the Line islands; and sugar and oranges in Tahiti. Several of them experimented in stock raising—in Tahiti itself and in isolated islands such as Caroline and Easter island. There were other lesser branches of trade, such as that in the timber of the Cook group. But quite a new factor was introduced into the economic life of Tahiti with the arrival of William Stewart. Stewart was interested in the large-scale development of plantation agriculture. He obtained the promise of a large concession of land from the Commandant, M. de la Richerie; returned to England to form the Tahiti Cotton and Coffee Plantation Company; and came back to Tahiti to establish in 1864 or 1865 an immense plantation at Atimaono on the south coast of the island, with a branch establishment on Nukuhiva in the Marquesas. Stewart was given every encouragement. Chinese labourers were imported for the plantation. Within a few years the cotton of Atimaono was the principal export of the protectorate, and a beginning was also made in the cultivation of sugar cane. For the time Stewart was the most powerful man on the island.

But when the price of cotton fell soon after 1870 (and the funds of

the company seemed also to have been strained by other losses) Atimaono closed down. The hopes which the French had entertained that Tahiti would soon establish itself as an important producer of tropical agricultural crops had been for a period destroyed. It was the first of a long series of disappointments regarding the economic prospects of the island which the French were to encounter.

Comparative Values of Exports and Imports, French Establishments in Oceania, 1923–39

Value in francs (in 000's) to nearest thousand.

Year	Exports	Imports	Total trade
1923	28,421	27,138	55,559
1924	57,039	42,107	99,146
1925	50,551	43,966	94,517
1926	53,650	49,944	103,594
1927	49,032	50,596	99,628
1928	46,250	52,752	99,002
1929	50,873	48,616	99,489
1930	37,702	45,291	82,993
1931	24,396	26,187	50,583
1932	21,011	24,718	45,729
1933	14,753	19,471	34,224
1934	16,879	20,133	37,012
1935	25,674	24,503	50,177
1936	38,968	36,741	75,709
1937	54,174	53,285	107,459
1938	47,647	63,241	110,888
1939	63,526	80,482	144,008

Based on *L'Océanie Française*, 1924–40, *passim* (Paris). The figures for the later years are not identical with those given in *Annuaire Statistique*, 1938 (Paris, 1939), but the latter do not agree with detailed analyses.

The commerce of the colony remained practically stationary for a long period about the close of the nineteenth century, when production was primarily in the 'monoculture' stage of concentration on copra growing. But from about 1908, when exports were a little over 3 million francs, a rapid increase set in, owing mainly to a rise in the price of copra, a rise in the price and the production of vanilla, and the development of phosphate in Makatea. After the war of 1914–18 the nominal value of the trade multiplied several times as the franc depreciated in value, exports amounting to 57 million francs and imports to 42 million francs in 1924 (see Table above). The figures remained in the vicinity of this level till 1929, after which they fell away rapidly during the economic depression. In recent years the trade has recovered again, by 1935 the colony had 'turned the corner' of the depression, and in 1939 exports and imports had

attained record levels. Part of this increase, however, has been due to a renewed fall in the value of the franc relative to other currencies in 1937, and since that date the considerable rise in the price of imported goods has not been offset to the same extent by prices in the export field. The resulting disequilibrium was by 1940 a matter of concern to the colony.

Trade Relations

The role of France in the trade of the colony has grown in importance in the last decade. As in the case of New Caledonia the more 'natural' markets of the French Oceanic Establishments lie

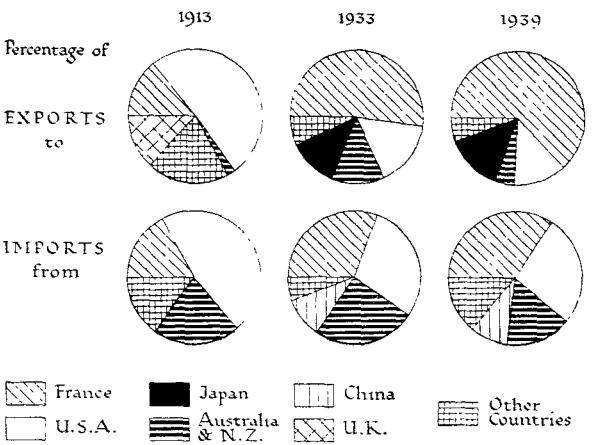


Fig. 31. French Establishments in Oceania: changes in foreign trade between 1913 and 1939

Percentages of total trade by value, based on: (1) Foreign Office, *Peace Handbooks*, vol. XXII, no. 145, 'French Possessions in Oceania', pp. 64–5 (London, 1920); (2) *L'Océanie Française*, 1934, p. 55; 1940, p. 26 (Paris).

in the countries around the Pacific basin, and until recent years France offered little incentive to the colony to divert this trade. Before 1914 the greatest share in the trade of the colony went to the United States, France coming next in order as buyer and below Australia and New Zealand as supplier. In the last decade, however, partly owing to the fall in the external value of the franc, and partly owing to tariff and other concessions, France has taken a much larger share of the trade. By 1930 exports to France had grown to 29 %, and this figure grew fairly steadily till in 1938 France took as much as 72 % of the colony's exports, mainly in the form of copra (of which she

was almost the sole recipient) and vanilla. Meanwhile the United States fell back as buyer, taking at times less than 10 % of the exports; in 1939 she took 13 %, almost wholly in vanilla. The place as second buyer from the colony was taken by Japan, who for the last five years or so absorbed most of the phosphate export. Australia, New Zealand and Great Britain take a small proportion of the exports; like China, whose share in the export trade is negligible, they are much larger suppliers than clients of the colony. As a supplier of goods to the colony, also, the interest of France has grown, and in the last decade she has provided rather more than 25 % of the imports. Though on the whole the United States is still the largest source of supply, at times her position has been taken by France, as in 1939 (Fig. 31). Trade between French Oceania and other French colonies is comparatively small, though recently imports from them have shown a rising tendency, from nearly half a million francs in 1938 to over a million francs in 1939 and $2\frac{1}{4}$ million francs in the first three-quarters of 1940. Exports to the French colonies, on the other hand, have been less than half a million francs in value during the whole period. Imports from Japan are also relatively small, totalling about $1\frac{1}{4}$ millions of francs from 1937 to 1940.

Entrepôt Trade

For some years the colony had a large entrepôt trade, amounting in 1932 to 31 million francs, chiefly due to the import and re-export of liquors to the United States via Mexico. This ceased to be of importance in 1934, after the repeal of the American prohibition laws.

Tariffs

Since 1928, the French establishments in Oceania have belonged to the group of colonies with autonomous tariffs, fixed by the local authorities with the approval of the Minister of Colonies. The system comprises mainly import duties with preferences favouring French goods; export taxes on copra, vanilla, pearl shell and phosphates; and an *octroi de mer* shared between the government and the municipality of Papeete. But the tariff is complex. As far as relations with France are concerned, copra and coffee were assisted for some years by a special duty levied on similar foreign imports into the mother country; the proceeds from this were then distributed in the form of a *prime* to the producers in the colony.

Currency and Credit

The currency in the colony is French, supplemented by notes issued by the Bank of Indo-China, a subsidiary of which plays the major role in the local banking system. An Agricultural Credit Bank (*Caisse Agricole*) was founded in 1863 to assist the development of the colony, and for many years was occupied with buying and selling of land, export of agricultural produce, and granting loans. But in 1936 this was liquidated, a lottery being issued to assist in the process, since the repercussions of the economic crisis did not allow the necessary financial obligations to be met from the budget. Since the end of 1933 the system of agricultural credit in the colony had been reorganized by the government in association with the Bank of Indo-China, a combination of central and local funds being made available to producers through agricultural associations. In 1934, thirty-four such associations had been created. The amount of capital made available for loans, however, was not large, and the calling in of sums due to the former Agricultural Credit Bank created a difficult situation for many producers. It would appear that the adequate provision of credit for agriculturalists, and the serious problem of the indebtedness of many of them to commercial establishments have not yet been solved.

COMMUNICATIONS

Sea Communications

For the colony as a whole, the most important communications are by sea. Until recently the vessels of the Union Steam Ship Company called monthly at Papeete on the voyage between New Zealand and San Francisco, and vessels of the Messageries Maritimes also called regularly on the voyage from New Caledonia to Europe. (See table on p. 126 for shipping movements for the colony.)

Regular communication between Papeete and the major islands of the colony has been organized by the administration at various times, but the service has not been maintained and the poverty of linkage has reacted on administrative, medical and economic development in the more distant groups. Occasional calls are made by vessels of the Messageries Maritimes at some of the islands, but practically all traffic is left to cutters, launches and auxiliary schooners run by private enterprise and keeping no regular schedule. The majority of these craft are built in the colony. Notable among them

are the cutters of the Tuamotu group, constructed by the natives themselves from local and Canadian timber and locally manned; in the first six months of 1939 these craft brought to Papeete 2,500 tons of copra, the product of co-operative agricultural societies in the group.

Movement of Shipping between French Establishments in Oceania and Foreign Countries, 1935–9

Year	Entry		Clearance	
	Number	Tonnage	Number	Tonnage
1935	69	270,414	69	270,792
1936	76	290,138	75	290,434
1937	89	270,668	85	270,911
1938	89	260,314	90	260,417
1939	84	251,252	82	251,965

Based on *L'Océanie Française*, 1936–1940.

In 1939 the 'mercantile marine' of the colony as a whole comprised 127 craft, aggregating 1,991 tons. These comprised: 2 sailing craft, totalling 10 tons, built abroad; 33 sailing craft, totalling 353 tons (including 1 of 56 tons), built locally; 10 steam or motor vessels, totalling 721 tons, built abroad; and 82 steam or motor vessels, totalling 906 tons (including 4 between 50 and 100 tons and 1 of 120 tons), built locally.

Roads

The small size of most of the islands and the absence of large centres of population except Papeete has restricted the growth of land communications. There are no railways, with the exception of a narrow-gauge light railway on Makatea. A good motor road, largely macadam but with a small section of bitumen surface, practically encircles the island of Tahiti. There are a large number of motor vehicles plying upon it. In the other islands, however, the road system, where it exists, is mediocre. There are roads on Moorea and on Raiatea suitable for motor transport, but other roads in the Leeward islands and the Austral islands are of doubtful quality. In the Marquesas, the Mangareva group and the Tuamotu group communication is available by horse-track or footpath only.

Air Communications

There are no airfields in the colony. A base to accommodate six seaplanes, mooted in 1935, has been partly established at Papeete; sea-

plane slips and oil stores said to have been laid down at Port Phaeton and in the Marquesas are not yet in existence.

Signal Communications

The telephone and telegraph system is poorly developed. In 1937 there were 27 postal bureaux, 9 telegraph bureaux with 6 miles of line, and 177 telephone instruments with 35 miles of line. The telephone service on Tahiti is controlled by a private company; that on Moorea is kept up by subscription.

In 1939 there were the following W/T stations: one private and nine official short-wave stations; two private and four official long-wave stations. The main sites of these are at Papeete, Afareaitu (on Moorea), Uturoa (on Raiatea) and Vaitape (on Borabora); Vaitepaoa on Makatea in the Tuamotu group; Rikitea in the Mangareva group; Atuona (on Hivaoa) and Taiohae (on Nukuhiva) in the Marquesas.

BIBLIOGRAPHICAL NOTE

General accounts of the French Establishments in Oceania are given by the following: Foreign Office, *Peace Handbooks*, vol. XXII, no. 145, 'French Possessions in Oceania' (London, 1920); Marguerite Verdat, 'Etablissements Français de L'Océanie', in *Colonies de L'Océan Indien et de L'Océan Pacifique*, in the series *Guide des Colonies Françaises* (Paris, 1931); S. Ferdinand-Lop, *Les Possessions Françaises du Pacifique* (Paris, 1933); G. Grandidier, *Atlas des Colonies Françaises* (Paris, 1934); S. Russell, *Tahiti and French Oceania* (Sydney, 1935); R. W. Robson (editor), *Pacific Islands Year-Book* (Sydney, 1939; and Wartime edition, 1942); E. de Curton, 'Tahiti Terre Française Combattante', *Publication de la France Combattante*, Brochure no. 101 (London, 1942).

Older accounts are given by H. Le Chartier, *Tahiti et Les Colonies Françaises de la Polynésie* (Paris, 1887); Dora Hort, *Tahiti, the Garden of the Pacific* (London, 1891); Arthur Baessler, *Neue Südsee-Bilder* (Berlin, 1900); F. W. Christian, *Eastern Pacific Lands, Tahiti and the Marquesan Islands* (London, 1910).

Most of the above works give some historical material. Other sources of general historical interest include: William Ellis, *Polynesian Researches*, 2 vols. (London, 1829); J.-A. Moerenhout, *Voyages aux îles du Grand Océan* (Paris, 1837); A. C. Caillot, *Les Polynésiens Orientaux au contact de la civilisation* (Paris, 1909); William Ellis, *A History of the London Missionary Society* (London, 1844); Bolton Glanville Corney, *The Quest and Occupation of Tahiti by emissaries of Spain during the years 1772–1776*, vols. I–III (*Hakluyt Society Publications*, series II, vols. XXXII, XXXVI, XLIII. London, 1913–18). Of particular cartographical and geographical interest are: L. I. Duperrey, *Voyage autour du Monde...sur la Coquille...1822, 1823, 1824 et 1825*, atlas (Paris, 1827); F. W. Beechey, *Narrative of a Voyage to the Pacific and Beering's Strait* (1825–28) (London, 1831); Charles Wilkes, *Narrative of the United States Exploring Expedition...1838–1842*, 5 vols, and atlas (Philadelphia, 1845). Political history and demographic history of the colony are discussed in S. H. Roberts, *History of French Colonial Policy*, vol. II (London, 1929); S. H. Roberts, *Population Problems of the Pacific* (London, 1927).

Up-to-date official information on the colony is difficult to obtain, since no annual reports or departmental reports are published. The principal source is the *Journal Officiel, Etablissements Français de L'Océanie*, published in Papeete; this is not easily available in Great Britain. A supplement, *Services des Douanes, Statistiques*, gives useful commercial information. *Te Vea Maohi* (The Native Messenger), also published in Papeete, is a small official journal in Tahitian; in addition to government proclamations, this issues educational articles, reports of native social gatherings, national fetes, etc. A small amount of statistical and other data is given in the *Annuaire Coloniale* (Paris, 1931); *Annuaire Statistique*, 1938 (Paris, 1939); *Annuaire du Commerce Didot-Bottin*, Départements, tome III; Paris, tome III (Paris, 1938). The latter volume of *Didot-Bottin* gives a useful account of tariffs.

The most valuable source of information on commercial, political, demographic and many other social matters is *L'Océanie Française, Bulletin Mensuel du Comité de L'Océanie Française* (Paris, 1905–40; published five times a year in recent years, the last number available being Mar.–Apl, 1940).

More specific references to individual groups and islands are given in the Bibliographical Notes to Chapters IV, V, VI and VII.

For maps see Appendix

Chapter IV

THE SOCIETY ISLANDS

Physical Geography: The Native People
The Windward Group—Tahiti; Moorea; Mehetia; Tetiaroa; Tapuaemanu
The Leeward Group—Huahine; Raiatea; Tahaa; Borabora; Tubai; Maupiti; Mopihaa, Fenua Ura and Motu One
Bibliographical Note

The Society islands, the most westerly group in the French Establishments in Oceania, and the most important, lie between lat. 15° 48′ and 17° 53′ S, and long. 148° 05′ and 154° 43′ W. They comprise fourteen islands, divided regionally by reference to the prevailing trade winds into the Windward group (*Iles du Vent*, to the east), and the Leeward group (*Iles sous le Vent*, to the west). The principal islands of the former are Tahiti and Moorea; of the latter, Huahine, Raiatea and Borabora (Fig. 32). General accounts of the history, population, administration and economics of the Society islands have been included in Chapter III.

PHYSICAL GEOGRAPHY

It is most convenient to treat the physical geography of the area under the individual islands, but a few general observations will supplement what has already been said in Chapter III.

Soundings show that the Society islands are not a continuous ridge rising far above the general level of the ocean floor and capped by a line of summit cones. The depths between Tahiti and Mehetia on the one side, and between Tahiti and Huahine on the other, are almost as great as those of the open ocean, reaching down to about 2,000 fathoms. The major islands consist fundamentally of high volcanic mountains surrounded by barrier reefs. The youngest volcano would seem to be that of Mehetia, the easternmost, while that of Tahiti in turn is younger and less eroded than that of Moorea which lies immediately to the west of it. Of the minor islands Tapuaemanu in the Windward group consists of a low volcanic core surrounded by coral flats, while Tetiaroa in the Windward group and Mopihaa, Fenua Ura and Motu One in the Leeward group are all of atoll formation.

By their latitude the Society islands are within the limits of the south-east trades, and at all times of the year the wind has a tendency

to blow from the east, often remaining for long periods between south-east and north-east. The regularity of the winds, however, is disturbed by the Tuamotu archipelago to the east, which by intercepting light, cool, easterly trade winds and raising the air temperature over its vast expanse of shallow lagoons tends to induce the entry of winds from the south-west. In the hot season, from December to April, the trade winds become weak and the Society islands are subject to calms, variable winds and storms. Between December and March, in particular, this part of the Pacific is liable to be traversed by cyclonic storms, usually moving in a south or south-east direction, and accompanied by heavy rain.

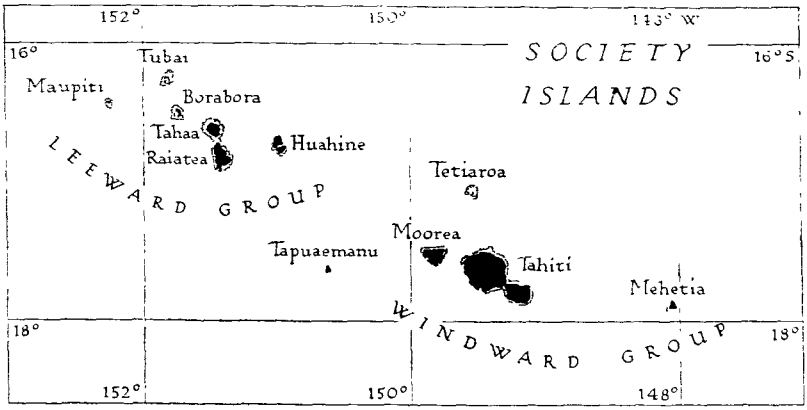


Fig. 32. Society islands

The small uninhabited islands of Mopihaa, Fenua Ura and Motu One, lying well to the west, have been omitted. Based on Admiralty chart no. 767.

The climate is hot and damp at all times, but on account of the southerly latitude the difference of temperature between the hotter and the cooler months is fairly well marked, especially at night. Maximum temperatures during the day rarely exceed 94° F. in the hot season in February and March, and 89° F. in the cool season in July. Average maximum day temperature is about 85° F. The mean temperature at night is about 75° F. in the hot season, but it falls to 70° F. and sometimes to 60° F. at night in the cool season.

Rainfall is on the whole considerable, though there is apt to be marked variation according to altitude, and on different coasts of the same island. Vegetation on the high islands is luxuriant and varied, but on the atolls it is less abundant, and the coconut palm is the dominant form.

THE NATIVE PEOPLE

Of the total population of the Society islands (nearly 31,000 in 1936) about two-thirds inhabit the Windward islands, principally Tahiti, and the remainder the Leeward islands. The majority are Polynesians, and since their character and way of life are essentially similar throughout the area, a general description is appropriate here.

The native people of the Society islands, especially of Tahiti, have become famous through the glowing accounts given of them by Europeans, from the days of the early navigators such as Bougainville and Cook to those of recent writers and artists, among whom Robert Louis Stevenson and Paul Gauguin are perhaps the best known. Through their comparative accessibility to civilization and the picturesqueness of their natural surroundings they have come to symbolize the 'South Sea Islanders' in their most romantic aspect. Though this popular view is exaggerated, they are in reality a good-looking, intelligent, polite and hospitable people, who have preserved for the most part a fairly simple way of life despite the many foreign disturbing influences to which they have been subjected, including a considerable amount of racial intermixture, especially in Tahiti.

Physical Type

The Society islanders show enough variation in type to suggest heterogeneous origin, but these variations are not so distributed as to point to any significant differences between the people of different islands. Nor do they bear out ideas about differences between descendants of people in various social strata.

The people as a whole are tall, the average stature being 5 ft. 7 in. (171·3 cm.), that is, about the same as that of northern Europeans. There is great variation in the head length and also in head breadth. But while extreme cephalic indices as low as 74 and as high as 97 have been found, the majority of the people have indices between 80 and 90, with a mean of nearly 85. This and other head characters place the Society islanders very near to the Hawaiians in type. In contrast to their wide heads, however, the Society islanders tend to have unusually narrow faces. The hair is mainly straight or gently waved, and in general is black or dark brown. There are no blondes, but more than 10 % of men and women have reddish brown hair. The eyes are brown, and usually dark, and more than three-quarters of the people have some development of the epicanthic fold which

gives a Mongoloid, slanting appearance to the eye, though the effect is usually slight. The nose is usually straight in profile, with the bridge of medium height, and is moderately thick, as are also the lips. Prognathism of the jaw is almost entirely absent.

Language

The common language of all the Society islands is Tahitian, which is one of the major dialects or branches of Polynesian. Like all Polynesian tongues, this tends to be of a soft, melodious character, since no two consonantal sounds occur together, and every syllable ends with a vowel.

Tahitian is marked by the absence of the *ng* and the *k* sounds, which are common elsewhere in Polynesia. The former is represented by *n* and both by the glottal closure ('); the latter is not normally used in written Tahitian, but its position can often be seen by the double vowel, as in the causative prefix *faa* or *haa*, which is extremely common. Words such as *faahou*, to renew (from *hou*, meaning 'new'), *faaroo*, to listen or obey (from *ro'o*, meaning 'to hear'), and the place name Faaa, should be written more correctly *fa'ahou*, *fa'aro'o*, *Fa'aa*, showing that there is a break in the voice.

In vocabulary Tahitian is rich, but under the influence of European contact many old words have dropped out of use. Their place has been taken by modern expressions adapted to the new needs of the people. Many common words are of English origin, such as *moni* (money), *raiti* (rice), *faraoa* (flour); while French terms such as *volontaire*, *avion* are increasingly used, and names such as *Paratane* (Britain), *Marite* (America), *Tapone* (Japan), *Patitifa* (the Pacific) have recently gained a wide currency. All these terms are used as part of the ordinary speech. Thus *e moni rahi* (meaning literally 'it's money, big') is the expression for dear in price.

Several small newspapers and journals are published in Papeete, including a few in Tahitian.

Culture

The Society islanders live primarily by agriculture and fishing, using comparatively simple equipment (Plates 23, 24). They cultivate the native foodstuffs such as taro, breadfruit and bananas, and supply their need for cash mainly by the preparation of copra, the cultivation of vanilla, and sometimes by the sale of fish and fruit and the hire of their labour. Despite the growing emphasis on individualism which has accompanied the increasing external social

and economic contacts, the ties of village and kinship unity are still strong, and are demonstrated in such enterprises as the communal fish drives which occur particularly on the smaller islands such as Tahaa and Maupiti.

Houses. The houses, set among coconut palms and other useful trees, and grouped irregularly in villages, are of simple wood and thatch construction. They show three main types. Along the coasts of Tahiti and Moorea especially, the floor is at ground level. On Maupiti and formerly in the inland villages of the larger islands the floor is set on

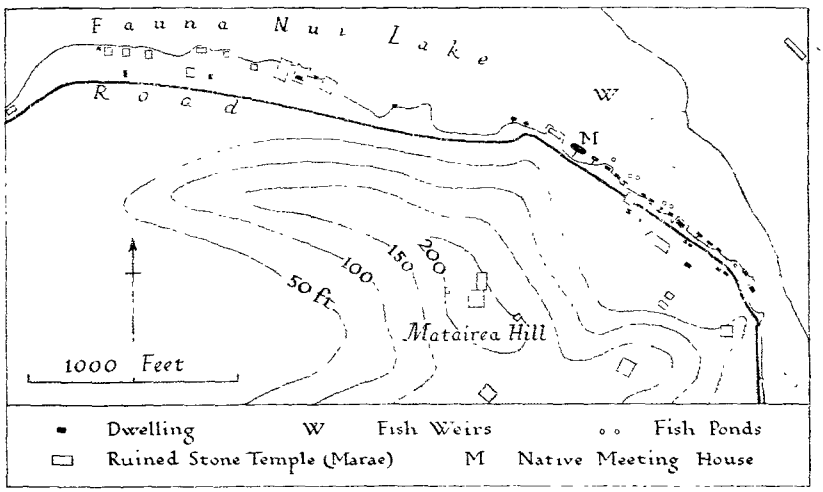


Fig. 33. Plan of Maeva village, Huahine

With houses built on piles over the water, fish ponds and fish weirs, this village is an interesting adaptation to lakeside conditions. The large number of ancient stone temples in the vicinity indicate its former importance as a religious centre. Based on K. P. Emory, *Bernice P. Bishop Museum Bulletin*, no. 116, p. 126 (Honolulu, 1933). Details of fish ponds, etc., are given by E. S. C. Handy, *Bernice P. Bishop Museum Bulletin*, no. 90, pp. 91–7 (Honolulu, 1932).

a low terrace of earth, stone or rubble enclosed in a dry stone wall; this was due primarily to the steep slope of the ground. In the Leeward islands generally the houses are built with the floor raised well off the ground on posts; on Raiatea and Borabora this floor platform is of separate construction from the house, while on Huahine it is lashed to the side posts of the house. On Huahine it has become increasingly popular to build these houses on piles over the water of the lagoon, since they are cooler and are freer from vermin there (Fig. 33). The dwelling houses are usually small, but some houses for public assemblies are very large, 100 ft. or more in length; the

largest recorded, in the early nineteenth century, was 397 ft. long. A common form of house, especially in the Leeward islands, had rounded or arched ends, but in the modern houses these have usually been replaced by flat sloping ends. Cooking is done in small separate buildings. Most of the houses still are built with a frame of coconut or breadfruit wood, and thatched with coconut or pandanus leaves, or with a species of *Andropogon* grass. But European influence has come increasingly to the fore. The sides of the house, which used to be open to the air, are now closed in with bamboo, partitions are used, and doors made of planks or bought as a piece of joinery now have replaced the former coconut matting. Simple wooden houses of European style are also built.

Native craft. Society islands craft used for fishing and travelling are of three main types. The simplest is the fishing canoe found throughout the group, consisting of a one-piece dug-out hull and an outrigger, rarely rigged for sail, but paddled, or sometimes poled. There is practically no keel, but the bow is shaped to a cutwater and the stern is pointed. The second type is the Leeward islands sailing canoe, a light craft with much the same lines as the fishing canoe, but with the hull usually built up; with sidestrakes, bow and stern pieces lashed with sinnet on to a dug-out. In addition to an outrigger these craft are fitted with a balance pole or sailing spar, on which a member of the crew stands when the outrigger is to leeward. The third type is the native-built cutter on which inter-island voyages are made with passengers and cargo.

In olden days the built-up craft were often large, up to 70 ft. or so in length, and the Leeward islands had a special style with a keel. With both these types the outrigger was sometimes discarded and two hulls were lashed together about 4 ft. apart with stout cross-bars to form a double canoe, on which a deck was built. These twin craft were used for long voyages and in naval battles.

Fishing. The great extent of coral reefs and the large lagoons make the Society islands a favoured fishing locality, and fish are taken by a variety of means—by trolling, by ordinary hook and line, by large seine nets, by casting nets, by spearing (Plate 23), by trapping in weirs, and by poisoning with the fruit of the *hutu* (*Barringtonia*) tree. Formerly fish were also dynamited, but this dangerous practice has now been forbidden by law. The fishing grounds, which are well known to the natives, vary in quality, and the best are regarded as private property, where permission should be asked to fish, and a small amount of the catch given as payment for the privilege. A good

fishing ground has sometimes determined the site of a village, as at Maeva on Huahine, where a conquering chief chose this unattractive position for this reason, and made it a political, religious and trading centre for the north of the island. It is important to observe that in the Society islands as in the Tuamotu group, fish of certain species are poisonous in one locality but not in another, and local knowledge should therefore be obtained before eating them.

The visitor will see rough weirs of stone in some of the lagoons or across the mouths of streams, especially at Maeva in the north of Huahine. (Duperrey in 1829 noted such weirs on the north-east of Borabora, and they are still marked on the Admiralty chart, but would seem to have long been abandoned.) The weir-traps at Maeva, which are famous, are built of flat blocks of volcanic rock, rising in walls to a foot or so above high-tide level, and are so constructed as to take advantage of the tidal flow, or the movement of the sea into the broad shallow salt lake when easterly winds are blowing. The fish follow the walls into enclosures, in which they are secured by scoop-nets or spearing (Fig. 33).

Political Organization. Like all Polynesian communities, the Society islands formerly had a well-developed political organization.

In the old social order, before the Society islands came under European control, the people were composed of three classes: chiefs and their relatives, landed proprietors, and commoners without land. In speaking of the government of the community the metaphor of a ship was sometimes employed. The people and the country at large were referred to as the 'canoe', the chief was the 'mast' and the landed proprietors were the 'rigging'. The organization and local government of the islands were more complex than that of most Polynesian communities. Each island was divided into a number of large districts, each with a chief and his landed proprietors, some of whom were important enough to be regarded as sub-chiefs. Bonds of kinship, service and tribute bound chief, landed proprietors and commoners together into a political unit which functioned for peace and war. Public councils met for open discussion of political affairs and disputes and there were also inner councils of chiefs, for which at times human sacrifices were needed as an act of consecration. The title to land was and still is hereditary, being determined by the nearness of genealogical relationship to former acknowledged owners. The visible token of ownership was the family *marae*, a temple or sacred erection of stone, where offerings were made to the family gods.

In the present administrative system little account is taken of the

former organization of chieftainship. The local chiefs of districts and sub-districts to-day are nominees of the government, and are not holders of hereditary titles; they are known to the natives as *tavana*, a corruption of the English word 'governor'.

Religion. The Society islands people have been Christian for over a century. Their ancestors formerly worshipped a hierarchy of ancestral spirits and superior gods, among the chief of whom was Oro the god of war. Invocations and offerings, sometimes including human sacrifices or the heads of warriors killed in battle, were made to these superior gods in temples. In some cases these temples were elaborate stone structures. In the Windward islands they were made by working and fitting small limestone and tuff blocks, and small basalt stones; in the Leeward islands great slabs of limestone, trimmed square, set on end and placed edge to edge, were used. The difference is partly due to the relative abundance of the kinds of material in the two areas, but partly also to two different local conventions of stone working. In all, the ruins of over 200 of these temples are known in the Society islands to-day, and more of them probably lie buried in the forest. The largest in Tahiti, the *marae* Mahaiatea at Papara, erected between 1766 and 1768 for the heir to the chieftainship of Papara, was described by Captain Cook, Sir Joseph Banks, and Captain James Wilson of the missionary vessel *Duff* shortly afterwards. Captain Wilson has left an engraving of it. It was an enormous pyramidal structure standing on a rectangular base about 270 ft. long by 90 ft. wide, with a summit about 50 ft. above ground level, reached by a flight of ten steps. The interior of the pile was of rubble, but the exterior was faced with large squared blocks of coral rock interspersed with layers of round river pebbles. The pyramid occupied one side of a court, the whole of which was walled around and paved with slabs of dressed rock. This particular temple was demolished about 1865 and its stones were used for bridge building. The most famous temple of all, that of the god Oro at Opoa in Raiatea, was known as Taputapuatea. Its platform, 141 ft. long and 24 ft. wide, faced with great coral slabs 5–10 ft. high, is still standing, though the human skulls and bones which littered it have been removed by Europeans.

Despite their Christianity, the people of the islands are apt still to retain some respect for and belief in the power of their past. They are often unwilling to set foot on a ruined temple site, and most of them firmly believe in, and fear, the ghosts of the dead, known as *tupapa'u*, which are held to cause illness and even death.



Plate 25. Bay adjoining Venus point, Tahiti

The narrow coastal flat and rugged mountainous interior, with deep valleys, are characteristic of most of the island. The sandy beach is of the type most frequently found on the northern coast.



Plate 26. Le Diadème, Tahiti

These pinnacles of volcanic rock, deriving their name from their resemblance to a crown, reach an altitude of nearly 4,500 ft. They can be seen from the sea, and are a well-known feature.



Plate 27. Arue, Tahiti

The coastal flat here is indented by small bays, with beaches of black sand, the edge of the fringing reef is shown by the white surf. Arue is a favourite resort for people from Papeete.

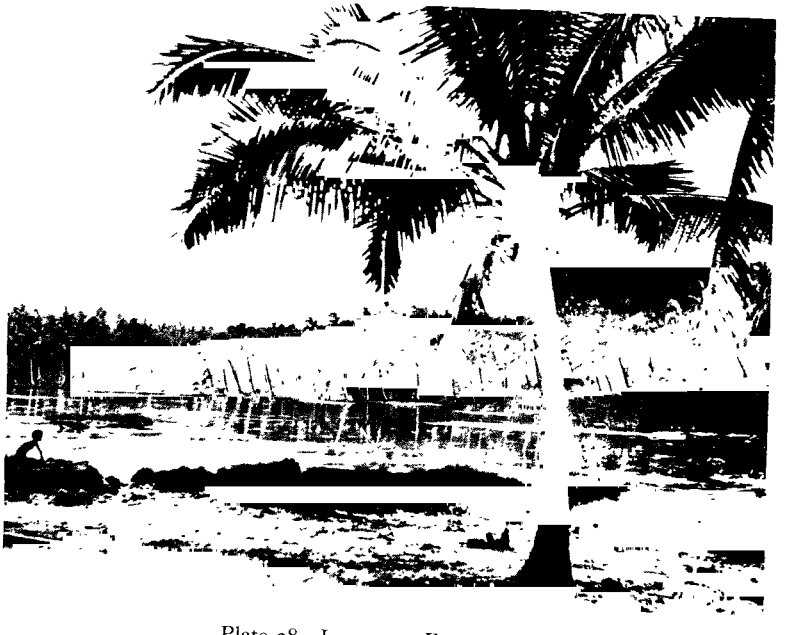


Plate 28. Lagoon at Faaa, Tahiti

There are many such quiet stretches of water within the reef on the west and south sides of Tahiti. The coconut palms are a usual feature, but the reeds are uncommon.

THE WINDWARD GROUP

TAHITI

Tahiti (between lat. 17° 30′ and 17° 50′ S; long. 149° 05′ and 149° 40′ W) is the largest and most important island of the Windward group, and of the Society islands as a whole. It is roughly of hour-glass shape, oriented north-west and south-east, with a larger portion called Tahiti, or Tahiti Nui, and a smaller, called Taiarapu peninsula, or Tahiti Iti; they are connected by the narrow isthmus of Taravao. The long axis of the island measures about 35 miles, and the total land area is about 402 sq. miles. It is the administrative, social and commercial centre for the whole of French Oceania.

Physical Geography

Structure (Fig. 34)

Tahiti is of volcanic formation, comprising the remains of two simple cones, without parasitic cones or irregular vents. The major cone, in spite of numerous deep radial valleys, is comparatively little altered from its original form, and from a little distance out to sea its character is very apparent (Fig. 36, Plate 25).

The centre of each portion of the island is rugged and mountainous, with a ring of peaks representing the walls of the ancient crater, but open to the north in a roughly semicircular amphitheatre. The highest summits are on Tahiti proper, Orohena (7,321 ft.), and on Taiarapu, Roniu (4,341 ft.). Other notable peaks on Tahiti are Aorai (6,773 ft.) and Le Diadème (4,362 ft.). These mountains are of wild, impressive aspect, with huge cliffs and narrow ridge crests. Le Diadème, on one of the ridges leading up to Aorai, presents on the west a cliff 1,000 ft. high and a number of points which give it a resemblance to a crown (Plate 26). Much of this mountainous interior has not yet been fully explored.

On the inner side the mountains drop abruptly to the immense crater floor, which itself has been dissected into a lower mass of hills, among which one, Ahititera (2,700 ft.), has been identified as the plug in the vent of the ancient volcano. On the seaward side the mountains show a continuous and fairly gentle slope towards the coast. In some districts the regularity of these outer slopes has been broken, and the angle of descent is less than usual. This is the case in Faaa, on the north-west of the island, where the result is due to a long lava flow

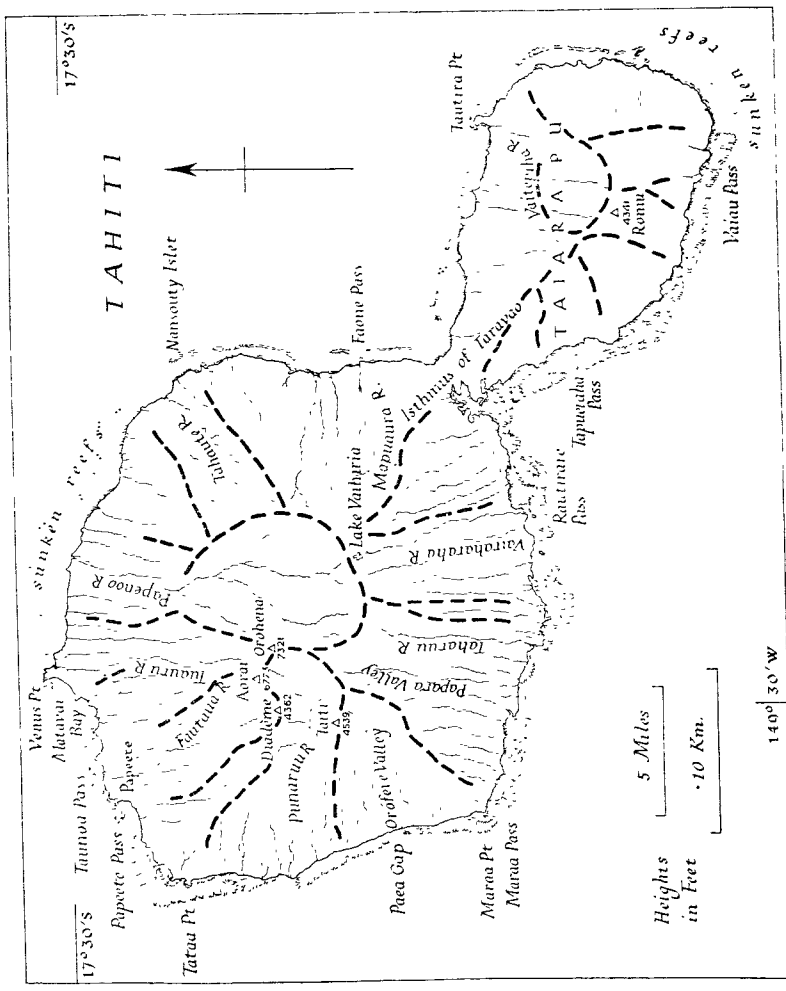


Fig. 34. Tahiti: physical

For general key to symbols see p. 8. Based on: (1) Admiralty chart no. 1382; (2) C. Crossland, 'The Island of Tahiti', *Geographical Journal*, vol. LXXI, p. 563 (London, Jan.–June 1928); (3) H. Williams, *Bernice P. Bishop Museum Bulletin*, no. 105, p. 13 (Honolulu, 1933).

which has extended the whole corner of the island farther into the ocean. In other cases, such as in Hitiaa, on the east, there are precipitous rock walls inland, due to earth movements. The formation of the isthmus of Taravao, which is of little elevation, is due in the main to an abnormally long lava flow from the smaller cone, Taiarapu, meeting one of these down-faulted areas of Tahiti proper.

Cliffs. The volcanic slopes end in cliffs almost all round the island, varying in height from under 100 ft. to over 500 ft. They are of marine origin, but in most places the sea no longer reaches their foot,

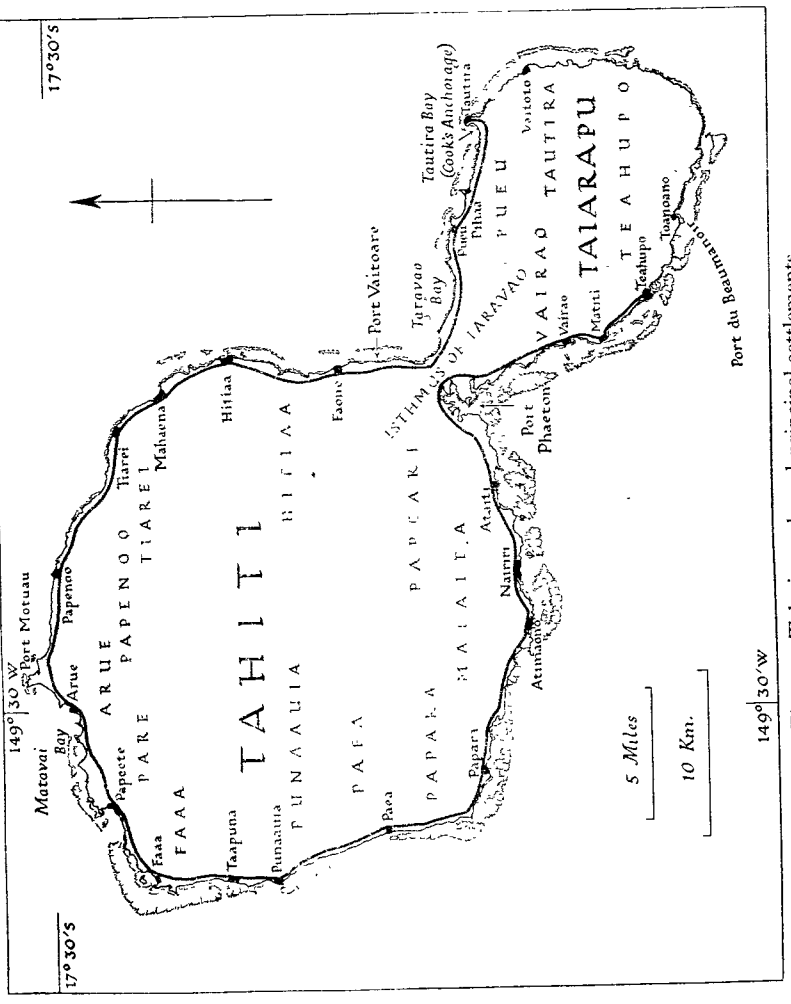


Fig. 35. Tahiti: roads and principal settlements

Names in capitals are those of the major districts. A road connection (not shown on the map) runs across the isthmus of Taravao. Based on: (1) Admiralty chart no. 1382; (2) G. Grandidier, *Atlas des Colonies Françaises*, carte 36 (Paris, 1934).

and they have now been reduced by weathering to steep slopes, with a smooth surface of clay and rubble, in which hard rock is rarely evident. They are absent from short stretches in the district of Faaa and from the isthmus of Taravao. Behind Papeete the cliffs are traceable only as banks 20–50 ft. high and are not always visible on the slopes. Around Port Phaeton they occur as red clay slopes 30–50 ft. high in a series of little rounded inland bays in the hills; here they have been formed by subterranean drainage and landslides. But in the more exposed areas of the south and east they become of

substantial size. Towards the south coast of Tahiti proper, after the Punaruu river is crossed, they are about 200 ft. high, rising to over 500 ft. in bare black rock at the south-west corner of the island, while they increase in height towards the south of Taiarapu peninsula until they reach an elevation of about 1,000 ft. Here the sunken reef off the shore has given them no protection from the sea. The same is the case on the north-east coast, where the barrier reef is present only as a series of shoals, and where the waves beat violently against a shore of black rocks, with high vertical cliffs of basalt behind them.

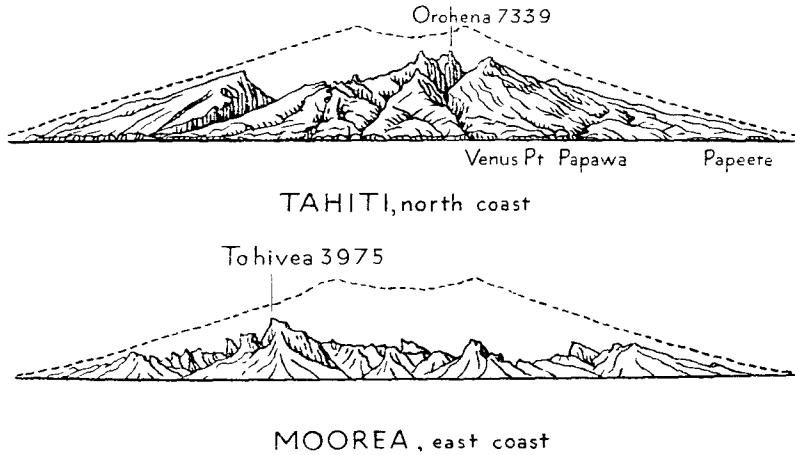


Fig. 36. Profiles of Tahiti and Moorea compared

The dotted line shows the probable shape of the original volcanic cone. Heights in feet. Based on H. Williams, *Bernice P. Bishop Museum Bulletin*, no. 105, pp. 18 and 65 (Honolulu, 1933).

Lowland Belt. In most places these cliffs are separated from the sea by a belt of flat land only a few feet above sea level and varying in width from a few yards to 1,000 yards or so (Plates 27, 31). The coastal flat, the major land of economic value in the island, forms but a very small fraction of the whole. It is almost the only area of cultivation and settlement. In formation it is essentially detritus built on old coral reefs when the sea level was higher than at present, and its surface is very even. This flat tends to be of greatest width on the protected western side of the island. The district of Faaa, in the north-west, is somewhat abnormal in that the true coastal flat is there largely replaced by a gently inclined low extension of the volcanic slope, undulating in character, with a seashore of red mud on which fresh-water reeds grow out into the lagoon. The reason for this latter

abnormality is the presence of bands of soft clay, through which fresh water seeps and supplies their roots (Plate 28).

River Valleys. The mountain masses of Tahiti are cut by many radial valleys, the larger of which are primarily deep gorges, rarely more than a mile wide, with steep sides marked by rocky buttresses, few side valleys and many waterfalls (Plate 29). In the lower courses the valleys have a gentle gradient, but as they approach the central massif the gradient increases rapidly, and the gorges end abruptly in amphitheatres commonly surrounded on three sides by steep cliffs several thousand feet high. Of these many valleys one of the most impressive is that of Punaruu on the west coast, an immense gash which cuts through the mountains and penetrates to the central amphitheatre. Between the valleys the ridges may be flat-topped, representing the original slopes of the lava flow, or they may be extremely sharp and rugged. At their mouths some of these valleys, as those of Punaruu, and La Reine, near Papeete, are flat-bottomed, probably due to the action of their streams at constant level; the mouth of the latter, it has been suggested, may have once been a fresh-water lake.

In each portion of the island the river system is simple. It radiates out from the central mountain mass, and the courses of the rivers tend to be short and comparatively straight. The change in the volume of the rivers according to the seasons is marked. During the rainy season cloudbursts in the mountains are common, and in a few minutes a stream fairly clear and only knee-deep may rise several feet and become a raging torrent which rolls along large boulders and excavates its banks rapidly. Flooding and erosion of the lower levels are frequent at such times.

Among the larger rivers are the Papenoo, on the north side, the most important in the island, with its source near Orohena; the Punaruu on the west side; and the Vaitepiha, on the north-east of Taiarapu peninsula. The island is very well watered; only in the Faaa district are streams infrequent. Alluvial fans at the river mouths are common, and all the rivers which enter the sea near passes in the reef have beach-dams, which in many cases have caused the mouth of the river to shift (Plate 30).

Lake Vaihiria. The structure of Tahiti does not encourage the formation of lakes, but towards the centre of the main portion, on the south slope of the principal concentration of peaks, lies the only one in the island, lake Vaihiria, at an altitude of 1,140 ft. and girdled round by impressive cliffs as much as 4,000 ft. high. This lake has been supposed to occupy the site of an ancient volcanic crater, but

in reality it owes its origin to sapping of decomposed lava or ash and landsliding of massive rocks from above. The lake is about half a mile long, 600 yd. broad and from 60 to 100 ft. deep.

Coast

Reef and Passes. A barrier reef encircles Tahiti at a distance of from 1 to 2 miles off the shore. For the most part this reef is awash or above water, but in two major stretches on the south-east side of Taiarapu peninsula and on the north-east side of Tahiti proper, it exists in sunken form, or as a line of shoals, at depths of 5 fathoms or so, and is particularly dangerous to shipping. Between the reef and the shore, except for a short stretch off the Paea district of Tahiti proper, there are narrow deep channels and basins inside the reef, offering many harbours.

Access to these harbours is obtained by numerous passes, about forty in all, which cut the reef at fairly regular intervals all round the island (Plate 31). Most of them, though narrow, are deep, and navigable for large vessels, though some demand local knowledge. Among the most important are Papeete pass and Taunoa pass on the north-west, leading to the port of Papeete; Rautirare pass on the south (the best in Tahiti), leading to Papeuriri bay and Port Ataiti; Tapueraha pass, to the south-west of the isthmus of Taravao, leading to Port Phaeton; a pass on the north side of Taiarapu, leading to Tautira bay; and Faone pass, leading to Port Vaitoare (see pp. 145–7). Others are also mentioned below.

Coastal Features. The coastline of Tahiti is not greatly indented. The only two major recessions are those which bound the isthmus of Taravao, the wide Taravao bay on the north side and the narrower more complicated inlet which ends in Port Phaeton on the south.* Prominent capes are also few. Four of the most prominent are Venus point, at the extreme north of the island, of alluvial formation; Tahara point (Plate 32), near by, projecting into Matavai bay, made of soft ash rock capped by red clay; Tataa point, the most westerly extreme of the island, of similar formation to Tahara point; and Tautira point, on the north-east of Taiarapu peninsula, of alluvial material.

A most marked feature of the coastline are the cliffs described

* These names are used here as given on Admiralty charts and in the *Sailing Directions*. It is reported that Port Phaeton is known as Taravao bay by the natives of Tahiti (C. Crossland, 'The Island of Tahiti', *Geographical Journal*, vol. LXXI, pp. 563, 572 (1928)).



Plate 29. Fautaua fall, Tahiti

The Fautaua river, the main stream in the north-west of the island, flows for the most part in a deep gorge with rocky sides. At this point it falls over a shelf of columnar basalt, in surroundings of great beauty.



Plate 30. Mouth of the Tautira valley, Tahiti

The Vaitepiha river emerging from the valley flows for some distance along the coast, protected on the seaward side by a sand bar.



Plate 31. Lagoon and pass near Punaauia, Tahiti
The white line of surf at the edge of the barrier reef, and the break at the pass are clearly shown. In the distance is Moorea.



Plate 32. Tahara head from the east
This cape projects into Matavai bay. On the north-east side, which is seen here, it has no protective growth of coral, and is being undermined by the sea.

earlier, standing back from the shore in most stretches, but reaching down to the sea especially at the south-east end of the island, and on the north-east side. Where the cliffs do not reach the sea little bays fringed with coral reef or with sandy beaches are common.

There are few islets round the Tahiti coast. Those that exist, such as Motu Au, near Venus point, Motu Uta, in Papeete harbour, and Nansouty islet, near Hitiaa, are all of coral formation.

Coastal erosion is a common phenomenon, to be seen in the cliffing of shores, the undermining of trees, and the removal by the sea of beaches which seemed to afford protection to the land. The action of the sea on the coast is modified by two factors. The tidal range is small, from 16 in. at springs to 6 in. at neaps. But variations of level in the lagoons are common, due to water thrown over the edge of the reef. In times of heavy surf, produced by distant storms rather than by local winds, the lagoon water may in places rise several feet above its normal level, and give rise to bores in the mouths of streams. The lagoon is then disturbed by powerful currents, which stir up the sand from the bottom, even at considerable depths.

A brief running description of the coast will be useful, considering it in two major sections: the leeward coast, on the west and south; and the windward coast, on the east and north (anchorages and harbours are dealt with in a following section).

1. *The Leeward Coast.* Venus point, on the extreme north of the island, is a long low stretch of land extending for about a mile from the foot of the mountains, forming a plain completely wooded with coconut palms and intersected by a river which runs through the Tuauru valley. On the point, which is marked by a lighthouse, is a tamarind tree, sometimes said incorrectly to have been planted by Captain Cook on his first voyage in 1769, to mark the spot where the transit of Venus was observed. Near by is a stone with a meridian line cut across it, reported (also incorrectly) to have been set in the ground by him. To the south-west of Venus point the north-west coast shows a succession of bays, often with sandy beaches; that of Arue is of black sand. A fairly narrow coastal flat, at times swampy, has low cliffs and hill slopes behind. Beyond Papeete harbour, bounded on the north by the low curving coral beach of Fareute point, the coastal flat broadens into a gentle slope, with undulations, in the district of Faaa. The most westerly extreme of the island, Tataa point, is a small low cape, with a cliff at its end about 20 ft. high, projecting into Faaa lagoon.

To the south of this point the barrier reef begins to close in to the

shore, until at Punaavia gap, opposite the mouth of the Punaruu river, the shoreline is open to the ocean. In this vicinity the beaches are of a mixture of black sand and coral debris, and the coastal flat is narrow, with some swampy ground at the base of the cliffs. About 5 miles to the south there is another break in the reef at Paea gap, opposite the mouth of the well-marked Orofere valley. About 4 miles farther to the south is Maraa point, low and wooded, projecting about 300 yd. from the foot of the mountains, which here fall towards the sea from elevations between 300 and 600 ft. At this point the coast makes a marked turn to the eastwards, and the aspect of the country changes, becoming more humid, with denser vegetation. Here are the districts of Papara, Mataiea and Papeari, the richest of the island, with more extensive coastal flats, up to 1,000 yd. wide and several miles long. Small rivers, among which the Taharuu and the Vaihiria are important, are especially numerous, some being utilized by the natives as drainage for their agricultural areas, which are here often swampy.

The isthmus of Taravao, sheltering the deep inlet of Port Phaeton on its south-west side, is a low plateau, with an elevation of about 100 ft. Beyond it, the southern side of Taiarapu peninsula shows a succession of low points along the shore, with a narrow coastal belt, and high mountains cut by deep valleys, at the back. This persists till Fareara point, the south-easterly extremity of the peninsula, is reached.

2. *The Windward Coast.* From Fareara point northwards for about 5 miles there are sunken reefs off the coast, which is here characterized by mountains falling to the sea in high precipitous cliffs, on which the surf breaks heavily. As the coast continues, however, it begins to be fronted by a narrow belt of low ground, and the wooded Tautira point is low, being formed of deposits from the Vaitepiha river. This river is the largest in the peninsula, and one of the more important in the island. Tautira bay, adjoining the point to the west, has a sandy beach on its eastern and south-eastern shore. For about 5 miles to the westward there is a succession of low wooded points, a rather narrow coastal lowland, and mountains with steep cliffs and many cascades at the back. As the coast continues the mountains descend in gentle slopes towards the isthmus of Taravao, while still fronting the sea in perpendicular cliffs with coastal lowland 200 yd. or so wide at their foot.

North of the isthmus, for about 6 miles to Hitiaa, the mountains are rugged, broken by ravines, densely wooded, and close to the coast. Around Hitiaa the coastal flat is fairly wide for a stretch of about

1 mile, after which the mountains close in again, and the shore becomes smooth and forbidding, with vertical basalt cliffs, till the country opens out again once more at the wide Papenoo valley. Beyond this again stretches a sandy beach about 4 miles long, with a line of high sandhills behind, clothed in palms and other vegetation, until Venus point is reached again.

Anchorages and Harbours

The many bays, natural basins and channels inside the barrier reef provide more than thirty anchorages for large vessels. Some of the best of these have been dignified by the title of 'ports', but for the most part they are no more than harbours, without facilities, and handle little in the way of trade. With the exception of Papeete, the only true port of any size in the island, they are therefore dealt with under this head. Only the more important are mentioned here.

The most important harbour (aside from Papeete) is Port Phaeton, at the head of an inlet on the south side of Taravao isthmus. This inlet is accessible by three passes, Matu pass, which is deep and clear, but sharply angled, Teputo pass, which is good for large vessels only in fine weather, and Tapueraha pass, which is narrowed by shoals but which is the most convenient. Anchorage is available in 5–11 fathoms, on mud bottom. The shores of the harbour are indented by small bays blocked with coral, but landing may be made at the head of the inlet at a stone jetty. There is a road which joins the main road round the island, and there is telephone connexion with Papeete. Port Phaeton has possibilities as a seaplane base.

On the north-west coast of the island useful anchorage is given by Matavai bay and Taunoa harbour. Matavai bay, a resort of early European vessels visiting Tahiti, is fairly open to the sea; it gives good shelter in winds from south-west through south to north-east, but is dangerous in north-westerly and westerly winds. Anchorage is to be found in 8–16 fathoms on sand. Taunoa harbour is entered by Taunoa pass, which is about 300 yd. wide, and is much used by sailing vessels entering Papeete harbour, since the winds are more regular than in Papeete pass. The harbour, which offers deep anchorage on black sand, gives good shelter from easterly winds, but is exposed to swell, and in north-westerly winds it is dangerous.

On the south side of Tahiti there are several good harbours, some almost completely reef-enclosed. Atimaono basin, near the village of that name, may be entered either by Teavera pass, which is wide but has depths of only 13 ft. on the bar, or by Aifa pass, which

narrows to an effective width of only about 100 yd. but is deep, with reefs steep-to within this space. The basin gives anchorage in 8–16 fathoms. A little distance to the east is Papeuriri bay, entered through Rautirare pass, which is about 400 yd. wide, clear, deep and practicable at all times. The bay itself has anchorage in 8–13 fathoms, on black sand, is clear of dangers, and is lined with a sandy beach. But it is not sheltered from the south, and with wind and sea from this direction vessels may have to seek shelter in adjacent channels. Farther to the east is Papeari harbour, entered by Temarauri pass, about 200 yd. wide, and giving anchorage in 13–19 fathoms, on mud. Between Papeuriri bay and Papeari harbour is the reef-bound basin of Port Ataiti, entered from the bay by the very narrow and rather shallow Otiaroa channel, or from the harbour by the wider and deeper Mutuoini channel. Anchorage in the basin may be found in 5–8 fathoms, on mud.

On the west side of Taiarapu, south of Port Phaeton, there are at least three good harbours. Port Vairao, a large basin entered by a channel from Tapueraha pass, offers anchorage almost anywhere, in 8–16 fathoms, on mud. Port du Beaumanoir and Port Vaiau, farther to the south-east, may both be entered by either Vaiau pass or Tutataroa pass, but the former demands local knowledge for navigation and the latter, about 200 yd. wide, is better. Port du Beaumanoir, a large basin, has anchorage in 13–22 fathoms, on sand and mud, while Port Vaiau, a fair harbour, has anchorage in 16 fathoms, on mud.

On the east side of Taiarapu peninsula, anchorages, where they exist, are of indifferent quality. On the north side of the peninsula they are better, though apt to be exposed to northerly and easterly winds. One of the best is Tautira bay, used several times by Captain Cook. It is reached through a gap in the reef about half a mile wide, with deep water, and being sheltered by Tautira point it gives protection from winds from north-east through south to west-north-west. It has anchorage in $8\frac{1}{2}$ fathoms, on sand, and landing may be made on a sandy beach. It is dangerous, however, in northerly and north-westerly winds. Adjacent to Tautira bay and reached from it by a channel is Port Pihaa, a deep basin with anchorage in 16–19 fathoms, on sand and mud. Port Pueu, at a little distance, a basin of about 500 yd. extent, is best entered from Taharoa pass, which is about 800 yd. wide; it gives anchorage in 13–25 fathoms. Both this and the wide expanse of Taravao bay, adjoining it, are exposed to northerly and easterly winds, and the entry to the bay, by any one of four passes, demands local knowledge.

The east side of Tahiti proper offers several useful anchorages. The best would seem to be Port Vaitoare, entered by Papeivi, Vaihi or Faone passes. This harbour is clear of dangers and anchorage may be had in 19–27 fathoms on sand and mud. Port Tematoe, an anchorage about 2 miles long by 400 yd. wide, is entered by Faatautia pass from the south; it has anchorage in 13–22 fathoms, on mud. Bougainville anchorage (Port Hitiaa) lies inside Boudeuse pass; it is fairly sheltered, but is encumbered by coral heads.

On the north-east side of Tahiti a line of shoals renders the basins inside them dangerous except to craft with knowledge of the conditions. At the extreme north of the island, however, Port Motuau has anchorage up to 32 fathoms, on sand, and is useful as giving temporary shelter when strong westerly or south-westerly winds make Matavai bay and Papeete pass impracticable. It has its name from the small wooded islet about a mile east of Venus point, and the entrance is a gap in the reefs between them.

Climate

Owing to the great height of Tahiti there are important differences in both temperature and rainfall in closely adjacent regions. But exact records are scarce, and are mainly from two meteorological stations, at Papeete on the dry leeward side of the island, and at Motuini in the Papeari district of the south coast; both are at sea level.

The range of pressure for Papeete is very small, varying from a mean of 1,011 mb. in February to April to 1,015 mb. from August to October.

Winds are in general those described for the group as a whole, but are modified along the coast by the high mountains and by the action of the land and sea breezes. Prevailing winds along the coast are from east-north-east to east-south-east. When from east-south-east the winds divide on reaching Taiarapu peninsula, and a calm is left between Venus point and Maraa point. When from the east or east-north-east, they strike the north-east coast of Taiarapu, leaving the south-west coast of the peninsula in calm, while a breeze crosses the isthmus of Taravao and blows along the south coast of Tahiti. Off Papeete, as the wind hauls to the northwards the line of demarcation between breeze and calm beginning at Venus point swings in towards the land; the breeze blows along the coast as far as Fareute point, leaving the roadstead of Papeete in calm. At Papeete the land breeze usually begins at about 2000 hr. and continues till 0700 hr.; the sea breeze usually sets in about 0900 hr. and blows from the north-west,

dying away about 1700 hr. The island is liable to be traversed by cyclonic storms in the season from December to March, though it is unusual for it to experience more than one in a year.

The general set of the currents along the north coast of Tahiti is north-westward, and along the south coast it is south-eastward. But with westerly winds the set of the current is often reversed. The general rate in fine weather is only about 1 knot.

Temperatures are high, with no great range, being probably never below 59° F. or above 95° F. In five years' observations at Papeete the extremes were 61 and 93° F. Mean monthly temperatures range from about 76° F. in July and August to 84° F. in February and March.

Humidity at sea level is considerable, and the mountains are often enveloped in cloud.

On the whole the leeward (that is, the north and north-west) parts of the island are the driest; the west coast is rather wetter, and the south and east coasts are much wetter still. Precipitation in the mountains has never been measured but is probably heavier than that on the coast. At Papeete mean annual rainfall over five years was 72·3 in., though this figure may be somewhat higher than a longer average would give. A mean of 55·5 in. is sometimes given. Variation from year to year is considerable; whereas at Papeete in 1923, 77·6 in. fell, precipitation there was 120 in. for twelve months in 1925–6. The greatest fall appears to take place in the period December to March, the least in July and August. In one week at Papeete in 1925–6 (30 December to 4 January) 30 in. of rain fell. But the average number of days with rain seems to be in the region of 130.

At Motuini, on the eastern part of the south coast, in the Papeari district, rainfall appears to be roughly one-third as much again as at Papeete. The average annual rainfall in Papeari in the period 1922–31 was 106·7 in. This district gets the advantage of the moisture-laden winds which cross the low narrow isthmus of Taravao.

Water Supply. Water of good quality is plentiful in Tahiti from the many streams. There is a considerable amount of subterranean drainage also.

Soil

The soils of Tahiti are on the whole shallow, and not thoroughly decomposed. They are formed of disintegrated lavas and volcanic muds, mixed along the coastal flats with coral and shell debris. Apart from tracts long cultivated they seem to be comparatively poor in

decomposed organic material. In colour they vary from light yellow or yellow-red to deep red and even black. On the higher slopes and ridges they are generally paler than in the lower regions, and are of a coarse consistency, while in the valley bottoms, though scanty, they are dark and fine.

Vegetation

Vegetation is luxuriant over the whole of the island, with the exception of the rocky crags and cliffs. Broadly speaking, there are three main formations: on the coastal flats and the valley mouth floors, on the exposed slopes and ridges, and in the depths of the valleys.

On the coastal flats coconut, pandanus, *Barringtonia*, banyan, *Thespesia populnea* are common, and *Calophyllum* as small trees. A type of 'flame-tree' (*Erythrina*), *Hernandia ovigera*, and *Cordia subcordata* were formerly common, and used for domestic purposes, but are now scarce. On the shore the goat's-foot convolvulus (*Ipomoea pes-caprae*) creeps over the sand and hibiscus thickets stand in muddy waters in some areas. Mangroves are absent, though a reed grows out into the lagoon off the coast of Faaa. As the soil improves cultivated crops are found: yam, sweet potato, taro, banana, and some Polynesian arrowroot. There are many fruit trees and shade trees (including the tamarind, Malay rose-apple and other imported varieties), and around Papeete especially there are many exotic ornamental shrubs.

The vegetation of the mountain slopes is generally of the thicket or brush type, and often well-nigh impenetrable. On the lower slopes there are thickets of lantana or guava, of 'sensitive plant' or the fern *Gleichenia linearis*, the wiry climbing stems of which interlace in a dense growth up to 10 ft. or so in height, through which a way must be beaten or cut. This fern grows up to 5,000 ft.; in parts it is being driven out by the 'yellow elder', a shrub introduced from eastern tropical America. Above 5,000 ft. the growth is mainly of clubmoss (*Lycopodium*) and ferns, with some bushes, but little is known of the higher flora.

In the valleys there are many types of trees, ferns, parasites and orchids. Hibiscus, Tahitian chestnut (*Inocarpus edulis*), citrus trees (in the lower reaches) and mountain banana (*Musa fehi*) are common. This last, known to the people as *fei* and used by them for its fruit, grows between 1,500 and 2,500 ft. in the drier areas, but down to 100 ft. in the wetter sectors. In general, distribution of the mountain

flora is determined more by humidity than by temperature; on the east coast, mountain types descend the slopes much lower than on the drier side.

In all there are about 500 species of vascular plants in Tahiti, many of them introduced either by the Polynesians or by Europeans.

Social and Economic Conditions

The population of Tahiti in 1936 was 19,029. Complete figures of distribution of the various racial and national elements in the population at this date are not obtainable, but there were 3,369 Chinese. In 1931, when the total population was 16,781, the proportions were about 50 % Tahitian, 30 % European French (as distinct from the Oceanic native French citizens), 18 % Chinese, with a few hundred British, Americans and others. But a large number of those classed as European French, as also a fair proportion of the natives, would seem to be of mixed French and Polynesian blood; there is also a small degree of intermixture with Chinese. The extent of this miscegenation, however, is not revealed by the census figures. The interior of the island is mostly uninhabited, and settlement is practically confined to the fertile coastal belt, along which villages are ranged in scattered alignment, joined by the coastal road (Fig. 35). The one community of any size is Papeete, the only town properly so-called in the south-eastern Pacific.

Tahiti is the administrative focus for the whole of the French Establishments in Oceania, Papeete being the centre of government and the residence of all the principal officials. The island is divided into eighteen districts apart from Papeete, each under the control of a French gendarme, or *agent spécial*. Papeete itself is a municipality, its affairs being controlled by a mayor and fifteen councillors, who are elected every six years.

Agriculture is the main occupation of the people, copra and vanilla being the two most important export crops. (Statistics are included in the general figures for the colony.) The export of oranges and other tropical fruits to New Zealand was of some importance until it was restricted by high duties placed on foreign fruits imported into that country. Before the war there was some export of dried fruit, especially bananas, to France. Bananas, limes, oranges, guavas, mangoes, avocado pears, melons and passion fruit are plentiful, and tobacco is grown for local consumption. Rice has been introduced by the Chinese and swamp lands have been cleared for rice fields.

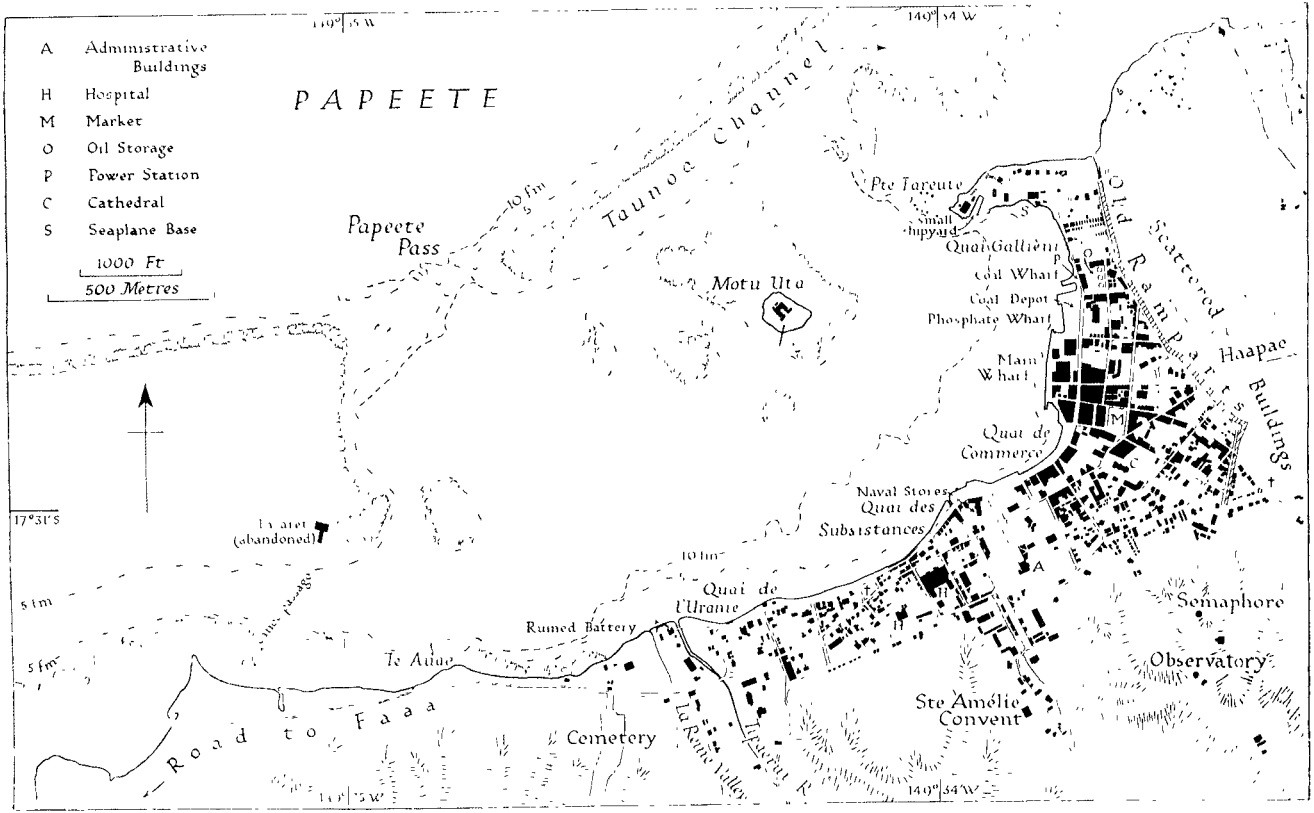


Fig. 37. Papeete

Based on: (1) Admiralty chart no. 3731; (2) Marguerite Verdat, *Guide des Colonies Françaises*, IV, 'Etablissements Français de L'Océanie', plan between pp. 16-17 (Paris, 1931); (3) other official sources. The building nearest A is the Residency.



Plate 33. Papeete from the harbour (in 1937)

The main wharf (Grand Quai), with its sheds, is in the centre, with the cathedral spire showing behind. The large white building on the right is a prominent hotel; the greater part of the town is hidden by the trees. In the background on the left rises Aorai (6,773 ft.).

The output is small and is all consumed in the colony. The Chinese also produce much of the vegetables for the Papeete market. Pigs, fowls, ducks and occasional turkeys are reared, while cattle have become increasingly important, there being estimated to be from 6,000 to 10,000 head on the island in 1931. There is also a small dairying industry at Papeete. The chief market for agricultural produce is in Papeete, to which the country people daily bring their goods. Much of the local commerce is in Chinese hands.

There is practically no industrial development in Tahiti, but a factory for canning pineapples and extracting pineapple juice was established in 1938 by the Société Industrielle Agricole de Tahiti. In 1939 exports from this amounted to 64 tons, valued at 383,000 francs. A sugar mill at Atimaono, the only one in the colony, has an annual production of about 500–750 tons and produces about 100 hectolitres of alcohol each year (apparently mainly for the manufacture of rum). There are three small shipyards at Papeete and a brewery.

Papeete

Papeete (Fig. 37), as the most easterly of the good ports in the Pacific islands south of the equator, is of great importance for the strategy and commerce of the Eastern Pacific. A place of no importance in pre-European times, its good harbour attracted vessels in want of supplies, and it speedily became a centre for trade and the dissemination of European influence in the Society islands. Its development, not spectacular, proceeded almost without incident save that it was shelled in 1914 by the *Scharnhorst* and the *Gneisenau*; much of the town was destroyed, but was rapidly rebuilt. At the present time it has a most important function in serving as a centre for the collection and distribution of goods for the whole of French Oceania. Not only overseas vessels but also schooners from as far afield as Rapa, Mangareva and the Austral group are to be seen there (Fig. 38, Plate 33).

Harbour. Papeete has one of the best harbours in the Society group. It is enclosed between the shore and the barrier reef, and access to it is obtained through either Papeete pass or Taunoa channel.

Papeete pass, the main entrance, is narrowed by shoals extending from the reefs to a width of 126 yd. with a least depth of $4\frac{1}{4}$ fathoms, or to 60 yd. with a least depth of $5\frac{1}{2}$ fathoms. A vessel of 28 ft. draught is locally regarded as being the deepest that can be taken in with

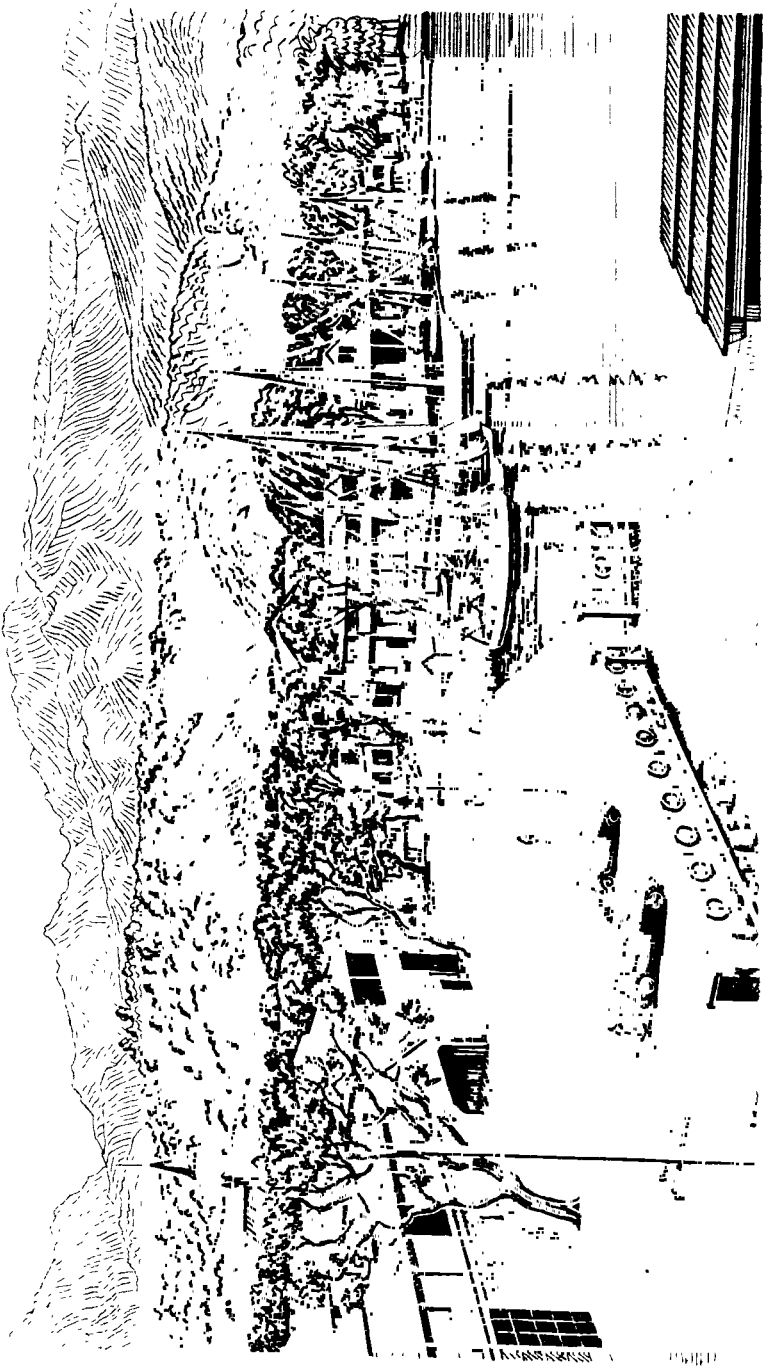


Fig. 38. Papeete: part of the waterfront
Local schooners at the Quai du Commerce; the spire of the Roman Catholic cathedral rises on the left. Based on a photograph.

safety. From November to April there is liable to be a sea on the bar, and currents in the pass may at times be dangerous, though they have little effect inside the harbour itself.

Taunoa channel, leading from the pass and harbour of that name, on the north-east side, is 1½ miles long and tortuous.

Papeete harbour is safe in all weathers except hurricanes. It is subject to frequent calms and shifts of wind, and is liable to much hot weather owing to diversion of the trade winds by the high land. Tidal range is less than 1 ft. Dangers are few, comprising primarily the sandy reef-fringed islet Motu Uta, about ½ mile south of the pass, and three detached reefs awash near by. The harbour has an extent of 1 mile by ½ mile, and anchorage is available almost everywhere in 8–18 fathoms, on sand and mud.

Accommodation. At the port, accommodation is available for vessels of large size, as well as for small craft. This comprises:

(i) The main wharf (*L'Appontement des Messageries Maritimes*) which is reserved for mail steamers, but which other vessels may be allowed to use. It is built of reinforced concrete, with two sections at an obtuse angle so that two vessels may work at the same time. The northern section is 410 ft. long, the southern 377 ft. long, and there is depth of at least 27 ft. alongside. Several large sheds of corrugated iron stand close by.

(ii) The phosphate wharf (*L'Appontement de la Compagnie Française des Phosphates de l'Océanie*) which exists primarily for the vessels engaged in traffic with Makatea. It is generally available at other times, however, and is used for coaling purposes. It is 150 ft. long, but the ends being clear, larger vessels may lie there. There is 27 ft. of water alongside.

(iii) There are several quays which are in effect parts of the sea wall. About 600 ft. of space here is available for vessels berthing a few feet clear of the sea wall in 16–21 ft., and about 2,000 ft. of space for sailing craft. At the Quai des Subsistances vessels less than 300 ft. long may moor by the stern; the Quai du Commerce usually accommodates local schooners, but larger vessels may moor off it; the Quai Galliéni and Quai de l'Uranie are merely extensions of the sea wall with beaches and shallow water off them. There are also several light mooring buoys in the harbour.

Facilities. Cargo is handled in all cases by ship's gear. Water is supplied at 40 tons per hour from pipes on the main wharf; no supply can be obtained out in the harbour. A variable supply of Australian coal is kept, estimates at different times being 2,500 and 4,000–7,000

tons. It can be obtained at the phosphate wharf in man-handled trucks or from a 30-ton lighter in the harbour. No fuel oil was available in 1940, but the phosphate company has three tanks for Diesel oil, with a total capacity of 3,000 tons. Supplies of fresh fruit and vegetables, ice, fish and meat may be had.

There are no tugs, but small motor vessels may be hired for the purpose. Three small shipyards on Fareute point build wooden vessels up to 300 tons and do minor metal repairs. There is a small slip, a marine railway with a steel sliding cradle which can take vessels up to 175 ft. long and 30 ft. beam. But vessels over 700 tons cannot be handled by it. Divers and diving apparatus are available.

The Town. Papeete, with a population of 8,456 in its commune in 1936, contains many shops and business establishments, several clubs, a bank, hotels and other amenities. The commercial centre is along the waterfront and in the streets adjacent to the market place (Plate 35), and the rest of the town is spread out in rambling arrangement among luxuriant gardens (Plate 34). The large stores are managed by Europeans, but most of the smaller shops are Chinese, and a part of the town forms practically a Chinese quarter. There are a Roman Catholic cathedral, two French Protestant churches, and several other churches. Most of the communication facilities and social services in the island are centred in Papeete. Hospital accommodation is available, and the quarantine station is at Motu Uta, a small island opposite the town. An electric power plant supplies light and energy, but owing to the high rates few appliances are in use. Fresh water is available in quantity and of good quality, from a dam in the Fautaua valley about 4 miles away.

The essential services of the municipality are financed by water rates, revenue from the public market and a part of the import duties.

Other Ports

Port Phaeton, Port du Beaumanoir, and other harbours practically devoid of facilities have been dealt with earlier (see Anchorages and Harbours, pp. 145–7).

COMMUNICATIONS

Sea Communications. Overseas contact with Tahiti was effected before the war by monthly calls of ships of the Union Steam Ship Company, on the voyage between Wellington and San Francisco, and by calls at about six weeks intervals or rather less, of vessels of the



Plate 34. Papeete from the south

Looking across the bay to the anchorage and quays. Fareute point is in the left centre and Motu Uta on the extreme left; Papeete pass (not shown) lies farther to the left. The open sea beyond the barrier reef which encloses the harbour shows in a darker shade.



Plate 35. A main street in Papeete

Looking south along the tree-bordered Quai du Commerce. The building in the distance (with a motor-car outside it) is one of the large commercial establishments.



Plate 36. Bridge over the Taharuu river

This is one of the main rivers on the south coast of Tahiti. The boulders on the bank indicate the degree to which the river may rise in flood.



Plate 37. Broom Road at Tiarei, north coast of Tahiti

For the most part this road runs along the coastal flat, but in places it has been necessary to cut away cliffs around headlands.

Messageries Maritimes *en route* between New Caledonia and Europe. Since the war services have been irregular and calls comparatively few.

Between Tahiti and other parts of the colony there was occasional communication before the war by Messageries Maritimes, which made calls at a few of the other islands. But launches, auxiliary schooners and sailing vessels supplied the greater part of the traffic. During the early part of the war the Diesel launch *Hiro* made weekly voyages to the Leeward islands from Papeete, but in 1941–2 she went only when cargo offered; there was usually a sailing fortnightly as far as Raiatea.

There are no regular air communications.

Roads. Although there are no railways in Tahiti, communication is given by a system of motor roads round most of the coast. The Broom road runs right round Tahiti proper, the main portion of the island, and connects at the Taravao isthmus with a road which partly encircles the Taiarapu peninsula but which is blocked from making a complete circuit by about 15 miles of impassable cliffs at the south-east end. The road goes as far as Tautira point on the north side of the peninsula, and Teahupoo on the south side. There are a number of bridges, either of wood or of steel, now being gradually replaced by concrete structures (Plate 36). The total road length is about 100 miles, of which only about 15 miles, between Arue and Paea, have a tar macadam surface (Plate 37). As early as 1931 there were about 700 motor vehicles in Tahiti; about 100 of these were available for hire in Papeete. Regular motor-bus services run daily from Papeete to the larger villages, and reach as far as the Taravao isthmus.

Communication in the interior of the island is extremely poor, owing to the rugged nature of the country. No roads cross the island except at Taravao, and the few foot tracks or horse tracks running inland up some of the valleys are all in bad repair and some are overgrown.

Signal Communications. Tahiti has a poorly equipped telephone system which links up Taravao, Port Phaeton and some outlying districts with Papeete. There is a telegraph from Papeete post office to the W/T station at Venus point. There are no submarine cables.

In addition to the W/T station at Venus point, there is a newer and more powerful station at Fareute point. Direct communication is maintained with New Zealand and Honolulu. Low-power stations have also been reported at Afaahiti and Papeari.

MOOREA

Moorea (between long. 149° 44′ and 149° 55′ W; lat. 17° 28′ and 17° 36′ S) was formerly known as Eimeo, from an ancient place name on the west coast. It was discovered by Captain Wallis in 1767, and was named by him Duke of York island. The nearest point of the island lies 9 miles west of the north-west point of Tahiti. It is roughly triangular in shape, with an area of approximately 50 sq. miles (Fig. 39).

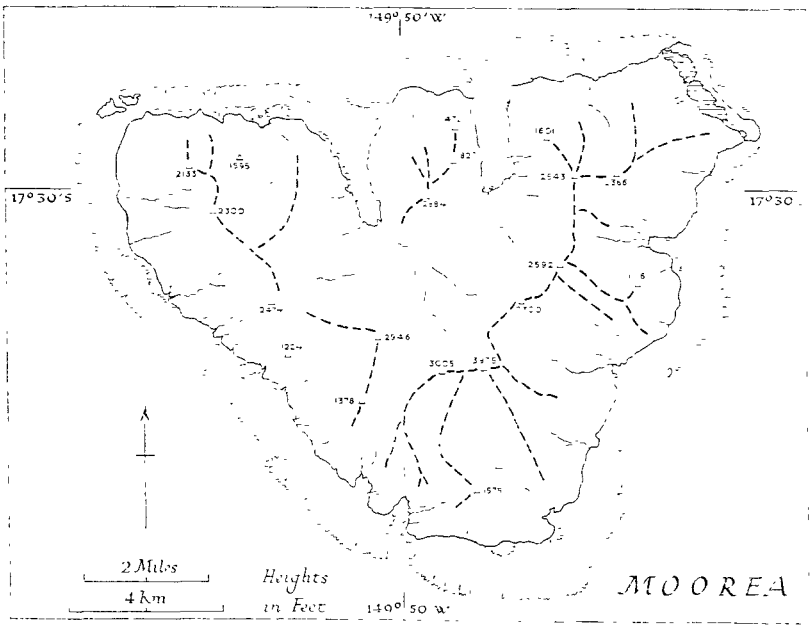


Fig. 39. Moorea: physical

Based on: (1) Admiralty chart no. 1382; (2) H. Williams, *Bernice P. Bishop Museum Bulletin*, no. 105, p. 64 (Honolulu, 1933).

Physical Geography

Structure

Moorea is of volcanic origin, but its valleys are broader than the canyons of Tahiti, with less precipitous sides; the crags and pinnacles of its fantastic castellated skyline give it a more broken appearance; and it is of lower elevation. All this indicates that its cone is of older formation than that of Tahiti. (Fig. 36 gives a comparison of the two.)

The backbone of Moorea is a chain of rugged mountains in the form of a semicircular amphitheatre, open to the north. The most notable highest points are Mt Tohivea (3,975 ft.) and Mouaroa (2,946 ft.), near the centre of the chain, but other peaks over 2,000 ft. high are numerous (Fig. 41, Plate 38). Among them is Mouaputa, the 'pierced mountain', which is precipitous and tooth-shaped, with a hole completely through it near the summit.

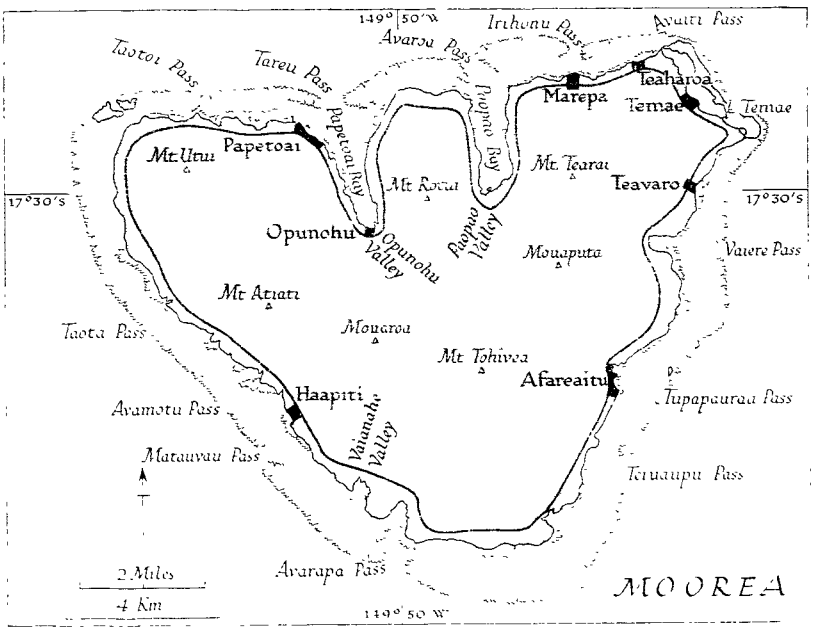


Fig. 40. Moorea: roads and settlements

Based on same sources as Fig. 39.

From the mountain chain on all sides but the north valleys plunge steeply down to the sea; they are short, none measuring more than about 2 miles in length. On the north, where the ancient crater wall has been breached, there are two rather longer valleys, the Opunohu and the Paopao, which empty themselves into the fiord-like bays of Papetoai and Paopao respectively. These two bays are separated by Mt Rotui, which has several peaks, the highest of which has an elevation of 2,884 ft. Rotui rises alone to the northward of a stretch of rolling lowlands which represent the ancient volcanic centre of the island. Coastal flats rim the island, but they are only a few hundred feet wide on the south side, except near the main valleys; on the north-

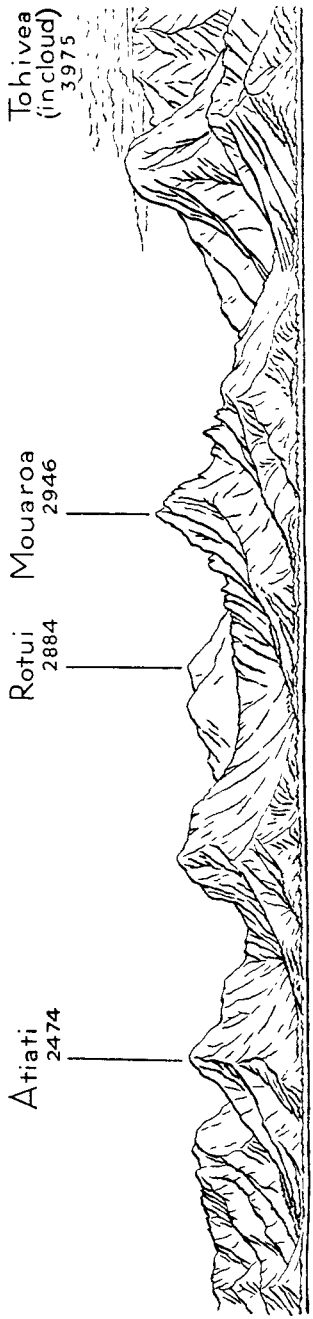


Fig. 41. Mountains of Moorea, from the south-west
Based on W. M. Davis, *Les Côtes et les Récifs Coralliens de la Nouvelle Calédonie*, p. 91 (Paris, 1926).

west, northern and north-eastern shores they are rather broader. On the extreme north-east they form a low wooded plain holding two interconnected lakes, which together make up a sheet of water nearly 2 miles long and $\frac{1}{4}$ mile wide; this is known as Lake Temae.

Coast

The immediate shoreline is low and fringed with trees, and there are many bays, of which the chief are Papetoai bay and Paopao (Cook) bay (Plate 39). Access to the coast is restricted by an extensive reef system.

A barrier reef surrounds the island, running almost parallel to the shoreline, being rarely less than half a mile or more than three-quarters of a mile from it. But at the north-east end the reef is almost joined to the shore. With this exception a canoe can circumnavigate the island inside the reef. But the lagoon is shallow for the most part. Except for a narrow channel along the southern half of the east coast, averaging from 13 to 20 fathoms in depth, the only waters of any considerable area with depths of more than 2–3 fathoms are in Teavaro bay on the east coast and in Paopao and Papetoai bays on the north coast; all these have depths of 10 fathoms or more.

Passes and Anchorage. The barrier reef is cut by a number of passes, but only three are really practicable for any but small craft, or craft with local knowledge. These are: Tareu pass leading into Papetoai bay and Avaroa pass leading into Paopao bay, both on the north side, and Vaiere pass leading into Teavaro bay, on the east side.

These bays provide good anchorage, in 10–18 fathoms, with good holding ground in most parts, though the bottom is coral in some places. Anchorage with good protection may also be had at Port Haapiti on the west side, but entry to it, through Matauvau pass, is somewhat narrow, and there is dangerous shoal water on the north side of the pass. Fierce squalls sometimes blow down from the mountains through the valleys into the bays, demanding attention to craft at anchor.

Landings. Landing on most parts of the coast is rendered difficult by the fringing coral reefs, but there are facilities in some of the bays mentioned above. The best landing would seem to be in Papetoai bay, at the village, where there is a pier with 14 ft. of water alongside, allowing schooners to tie up there. (A small pier at the hotel is suitable only for rowing boats.) There is a pier at Afareaitu, in Teavaro bay, but its condition is only fair, and a pier in Vaiere bay, near by, is poor and usable only in good weather. A pier is shown on the

chart at Pihaena, near the entrance to Paopao bay, but no information about it is available.

Water Supply. The water supply on the island is abundant. Streams and watercourses are numerous, though mostly short; the only river of any importance is that which drains the northern side of the mountain chain and flows into the head of Papetoai bay.

Vegetation and Fauna

Vegetation is luxuriant, except on the rocky cliffs and crags and in a few areas where the rocks have decomposed to a laterite which is covered only by stunted brushwood. The flora is of the type characteristic of these high volcanic islands.

There is little animal life. There are few native birds and no venomous reptiles, and the only animals of importance are wild pigs.

Social and Economic Conditions

The island is of some historical interest, as it was the headquarters of Pomare II during the war of 1808–15, which led to the final establishment of the Tahitian kingdom and to the conversion of the people to Christianity. The missionaries made their first converts among the men and women gathered on Moorea from all parts of the Society islands to help Pomare. Other results of missionary endeavour were the completion here of the first Polynesian-built trading schooner, and the promotion of the earliest experiments in the manufacture of sugar and of cotton cloth. Both these latter ventures, however, were before their time, and they had little success.

The inhabitants of Moorea are nearly all Polynesians. According to the census of 1931 the population was 2,011, including 101 Chinese, 5 Frenchmen, and 134 other foreigners. By 1939, it was estimated, the population had increased slightly.

For administrative purposes Moorea is divided into four districts, under a French government agent, who normally lives at Afareaitu, on the east coast. Each district has a school, but other social services are few.

The principal village is Afareaitu, the government headquarters, with church, school and several Chinese stores. Papetoai village, on the west side of the bay of the same name, is the second largest settlement, and has a hotel. Other villages are Teavaro on the east coast, Temae and Marepa on the north-east, and Haapiti on the west coast,



Plate 38. Mouaroa, Moorea

Seen from the north side. Mouaroa ('Tall Mountain', 2,946 ft.) is one of the most spectacular of the volcanic peaks of the island.

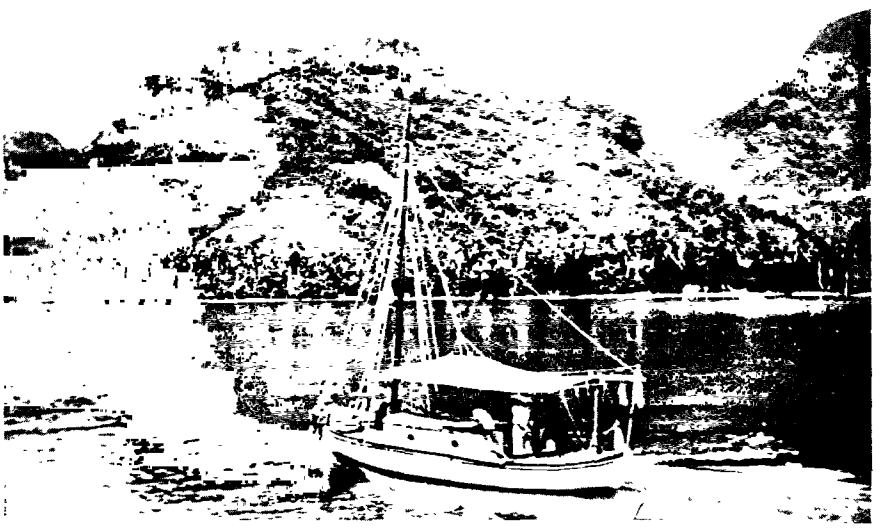


Plate 39. Part of Papetoai bay, Moorea

The view shows some of the pinnacles on the west side of the bay. The motor launch is of a type commonly used for local travel.



Plate 40. On the coastal flat of Moorea

Part of the village of Afareaitu, on the south-east, with the trade wind blowing. Taro is growing in the foreground.



Plate 41. Fare harbour, Huahine

Looking south. The wharf, with a small vessel alongside, is at the left, and the settlement is distributed around the shores of the bay.

but individual houses tend to be distributed along the coastal fringe (Fig. 40, Plate 40). The interior is not permanently inhabited.

The major occupations of the people are agriculture and fishing. Copra, vanilla, pineapples, coffee, bananas, timber and firewood are exported to Papeete on a small scale, as a result of native production. The Chinese, who are mainly storekeepers, grow a little tobacco and some vegetables. Some experiments in the growing of rice on swamp lands have been partially successful, and there were said to be sugar plantations at the head of Paopao bay and Papetoai bay in 1935. The interior of the island offers very good pig hunting, while Lake Temae is the resort of large numbers of wild duck as well as of a variety of herring known as *ava*. The lake is the private property of certain native families, and their permission should be obtained before shooting or fishing is done there. In normal times the scenic attractions of Moorea and its proximity to Papeete have made it a favourite visiting place for tourists.

Communications

Connexion outside the island is maintained with Papeete. In 1939 two motor launches made several trips a week, one going as far as Papetoai, the other round the south coast to Haapiti, and each calling at several villages. Inter-island schooners also call at intervals. The ease of travelling round the island inside the reef for most of the way has led to much communication between villages by canoe, but these craft are on the whole less well built than the canoes of the Leeward islands.

A coastal road about 35 miles long encircles the island. It is of fair quality, with a surface of shell and coral rock, and is used mainly by bicycles and horse-drawn vehicles. In 1939 there were three motor-cars on the island. A few foot and horse tracks lead up the main stream valleys into the interior, and one such track leading at the back of Mt Rotui connects Paopao bay with Papetoai bay.

There is a W/T station at Afareaitu, on the east coast, but there is no other telegraph or telephone on the island.

MEHETIA

Mehetia (approx. 17° 55′ s, long. 148° 02′ w) (locally called Me'etia, the old name being Me'etu) was discovered by Wallis in 1767; Spaniards under Boenechea landed there in 1772. It is the most easterly of the Society islands, lying 60 miles east of Tahiti.

Structure (Figs. 42, 43)

The island consists primarily of a bold volcanic cone, rising out of the sea to a maximum height of 1,427 ft. with a remarkably steep

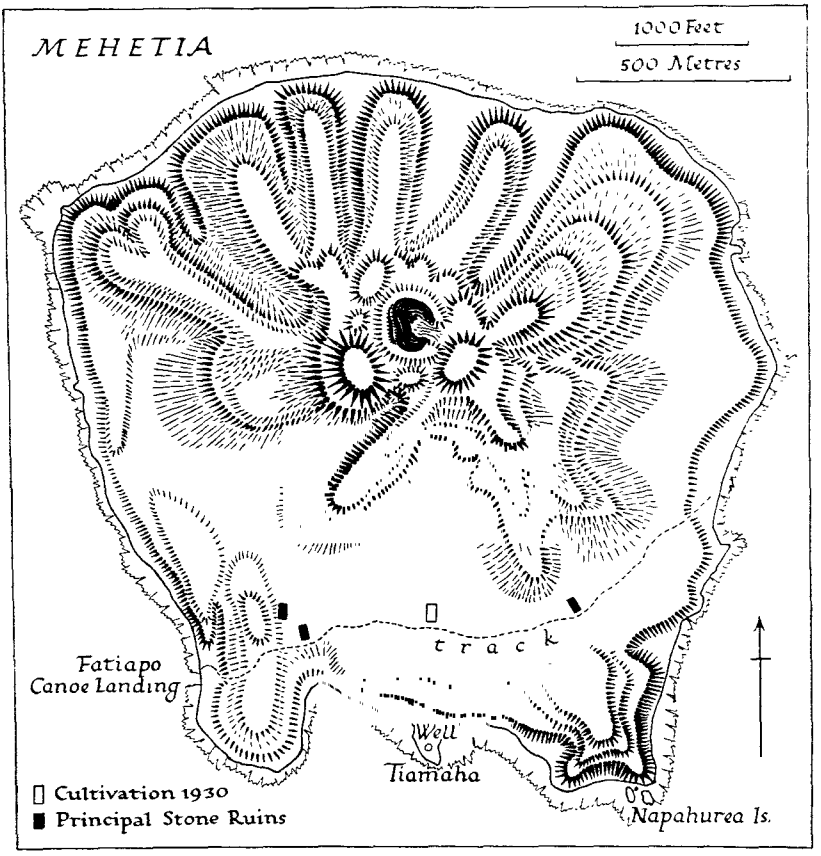


Fig. 42. Mehetia: sketch map

Based on: (1) incomplete survey by F. Hérault in 1928 and description by K. P. Emory in 1930—in K. P. Emory, *Bernice P. Bishop Museum Bulletin*, no. 116, pp. 109–19 (Honolulu, 1933); (2) sketches and account by Don Domingo Boenechea —in Bolton Glanville Corney, *The Quest and Occupation of Tahiti...*, vol. I, pp. 292–7 (*Hakluyt Society Publications*, series II, vol. XXXII, London, 1913).

northern side, and a more gradual slope on the south side. It is approximately circular in plan, and about 4 miles in diameter. Slightly below the summit peak, to the north-west, there is a well-preserved crater roughly 200 yd. in diameter and 375 ft. deep; from it

many recent lava flows have issued. At some period following the formation of the main cone a fringing reef appears to have developed round the shore and then been raised with the island as a whole. The only visible remains of this reef now are patches of elevated limestone along the southern shore, the bulk of it having been covered by lava and ejected material from the secondary crater. Owing to the presence of so much scoriae and tuff marine erosion has proceeded rapidly, so that cliffs from 40 to 100 ft. high occur almost continuously round the coast. Geologically Mehetia appears to be more recent than other volcanic islands of the Society group.

A narrow fringing reef now surrounds the island, projecting at its widest about 250 yd. from the shore. There is no lagoon, and though landing may be effected on the southern part of the reef, it is nearly always with difficulty.



Fig. 43. Mehetia: two views

As seen by the Spanish explorer Don Domingo Boenechea on 6 November 1772. View A from the south-west; view B apparently from the south-east. Based on Bolton Glanville Corney, *The Quest and Occupation of Tahiti...*, vol. I, p. 294 (*Hakluyt Society Publications*, series II, vol. XXXII, London, 1913).

Settlement

A narrow elevated fertile shelf or plateau running for about a mile round the south-east and south sides of the island affords attractive land for limited cultivation and settlement. A spring in the centre of the plateau and a well on the south-east shore supply drinking water. At the end of the eighteenth century the native population was estimated to be between 100 and 150; about 1885 there were said to be 60 or 80 survivors of a larger population living in two old villages; but in 1930 only two native families were living there, and in 1934 the island was uninhabited. It seems now to be visited only spasmodically by fishermen from the south end of Tahiti. Most of the land is owned by a European.

Mehetia was in former days the point of departure from the Society islands to the Tuamotu archipelago, and lay on a native trade route, to secure pearl shell for the manufacture of fishhooks, fish lures and

ornaments. In 1934 wild goats, wild pigs, fowls and fruits were said to be plentiful.

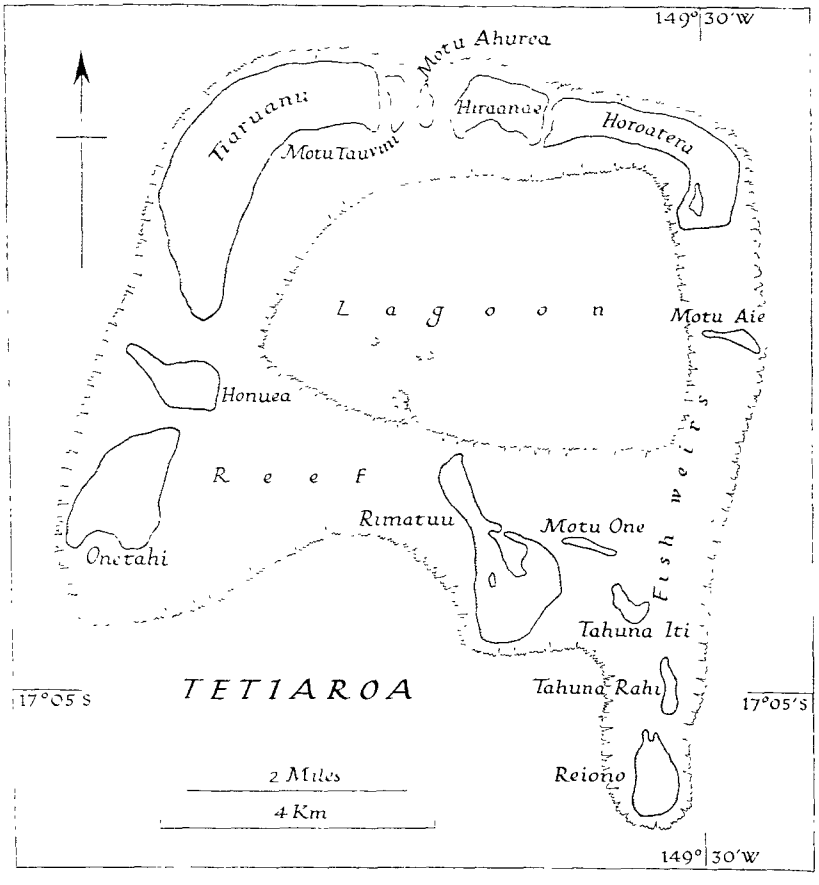


Fig. 44. Tetiaroa

The fish weir traps (shown as in 1914) are built of pieces of coral; three are shaped to take fish coming out of the lagoon on the ebbing tide and two to take fish entering the lagoon on the incoming tide. Based on K. P. Emory, *Bernice P. Bishop Museum Bulletin*, no. 116, p. 120 (Honolulu, 1933).

TETIAROA

Tetiaroa, situated 26 miles north of Tahiti, is an atoll composed of thirteen islets, the largest being about 2 miles long. The combined land area is about 1,600 acres, the whole of which has been planted with coconuts. There is no passage into the lagoon, and even canoes

must be hauled over the reef. But the landing place, on the south-west side of the islet Rimatuu, has been reported to have been improved by the erection of a small jetty to the edge of the reef, with a movable extension projecting beyond the breakers.

The atoll is uninhabited, except for labourers engaged in preparing copra. The interior of the lagoon was once noted for its fine pearls, but no diving has been carried out there in recent years. Good fishing is to be found off the atoll. The fish weir traps have been built there by natives. Those shown on the map (Fig. 44) are as recorded in 1914.

Tetiaroa was formerly owned by the royal family of Pomare, but in 1936 it was the property of the British consul in Papeete.

TAPUAEMANU

Tapuaemanu (known also as Tubuai Manu or Maiao), was discovered by Captain Wallis in 1767. It is a small island lying approximately 50 miles west of Papeete. Its greatest length, from east to west, is about 6 miles, and the total area is about 2,100 acres (Fig. 45).

Physical Geography

The island consists of a volcanic core surrounded by low coral flats in which lie irregular shallow lagoons, and the whole is encircled by an outer lagoon and barrier reef, which is awash. The central volcanic ridge, approximately 1½ miles long, is almost parallel to the general trend of the Society islands arc; it is highest at its ends, that on the west, the point of maximum elevation, being 550 ft. and that on the east being 480 ft. high. Small cliffs mark the base of the ridge, and along its crest decomposition of the lava has produced bright varicoloured clays. There is a fair landing place for boats on the south side of the island when the wind is offshore, but owing to its inaccessibility from the village this is seldom used. The normal landing is through a tortuous slit in the fringing reef on the north-east side. Anchorage for small vessels in about 8–10 fathoms is reported to exist about 300 yd. seaward of the reef on the south side.

Good water is scarce on the island, the natives relying on a few springs which issue from the base of the ridge. The lower ground abounds in coconut palms and other trees, but much of the high land is covered in bracken.

Social and Economic Conditions

The population consisted a few years ago of a little over 100 people, including one European, who owns much of the land and works it as a plantation. The village, with church and schoolhouse, is on the south side of the ridge.

A small amount of copra, arrowroot and other produce is exported, as well as a species of large crab from the inner lagoons; this commands a good price on the Papeete market. But the island is of little commercial importance and is seldom visited.

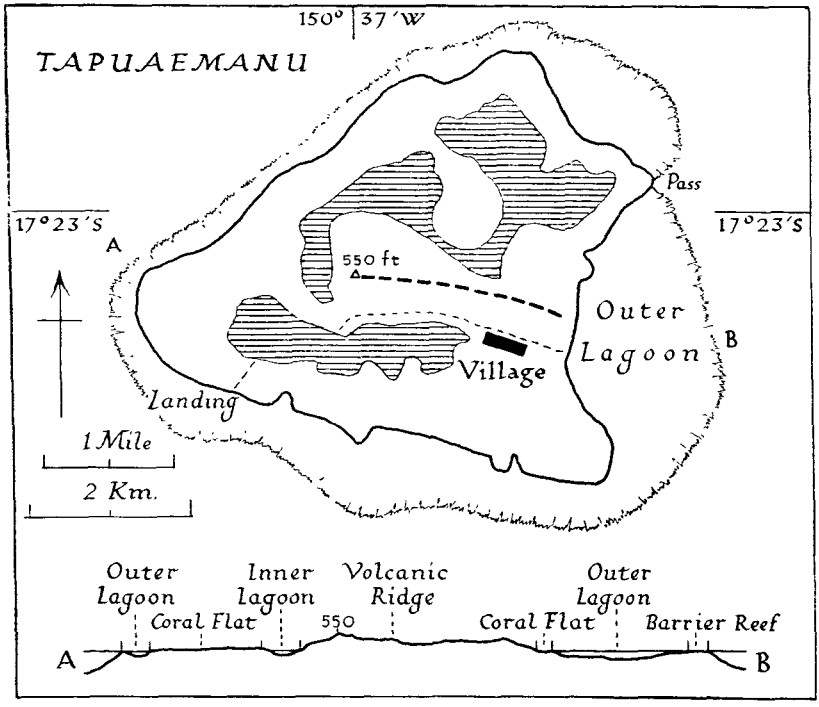


Fig. 45. Tapuaemanu: plan and section

For general key to symbols see p. 8. *Sailing Directions* and other official sources do not agree on the elevation of the highest point or on the position of the pass and landing. Based on H. Williams, *Bernice P. Bishop Museum Bulletin*, no. 105, p. 74 (Honolulu, 1933).

THE LEEWARD GROUP

HUAHINE

Huahine (between approximately lat. 16° 40′ and 16° 50′ S, long. 150° 57′ and 151° 03′ W) is the easternmost island of the Leeward group, situated about 80 miles north-west of Tahiti. It was discovered by Captain Cook in 1769.

Physical Geography

Structure

About 20 miles in circumference, the island is divided into two parts at high water by a narrow strait, which forms an uncovered isthmus at low water. The larger, northern portion is known as Huahine Nui (Great Huahine) and the smaller, southern portion as Huahine Iti (Little Huahine). The island is high and rugged, the mountains reaching an extreme elevation of 2,331 ft. in Mt Turi in the north. Mt Paeo, also on Huahine Nui, is 1,427 ft. high with a sharply pointed peak; Mt Maufene, the highest point on Huahine Iti, is 1,497 ft. high. There is no continuous plain between the mountains and the shore except in the north and north-west, but there is in most places a narrow strip of fertile land.

Around the northern end the original barrier reef has become so raised and connected with the shore as to form solid land for most of its extent. It is here wooded almost to its outer edge, and forms a cultivated plain. Between this plain and the original shore of the island are two lagoons. The smaller of these, Fauna Iti, has no outlet. The larger, Fauna Nui (called lake Maheva on the charts), communicates with the sea by a channel which ultimately leads out at Tiare pass; it has average depths of 4–6 fathoms and is fringed with coral.

Coast

The entire island is surrounded by coral reef which on all sides but the north is of true barrier form, its outer edge lying between half a mile and a mile from the shore. On the eastern side there are several islets on the reef, but elsewhere it is either awash or sunken. On the western side in particular a channel over 5 fathoms in depth runs for a considerable distance between the reef and the shore (Fig. 46).

There are six passes through the reef, of which Uramoa (False) pass, the most northerly on the eastern side, is unnavigable. Tiare

pass, immediately to the south of this, is deep but narrow, and is suitable only for small vessels with local knowledge. Farerea pass, eastward of the isthmus dividing the two portions of the island, like

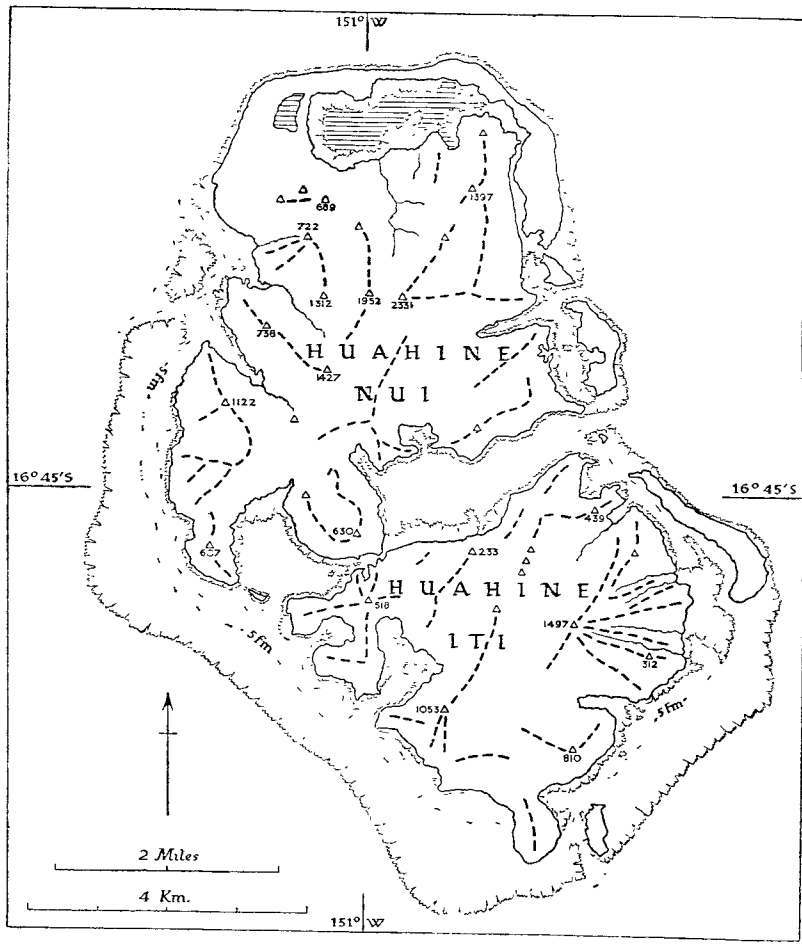


Fig. 46. Huahine: physical

Based on: (1) Admiralty chart no. 1060; (2) P. Huguenin, *Raiatea la Sacrée*, p. 28 (Neuchâtel, 1902).

Tiare pass is deep but narrow and dangerous in easterly winds. In fine weather it is practicable for all vessels with local knowledge. Araara pass, near the southern extremity of the island, has a depth of only 16 ft. and is full of coral patches; its use is limited to small craft

and only then in favourable circumstances. Tiare, Farerea and Araara passes are connected by boat channels inside the reef. On the west side are Avamoa and Avapeihi passes, connected by a narrow but

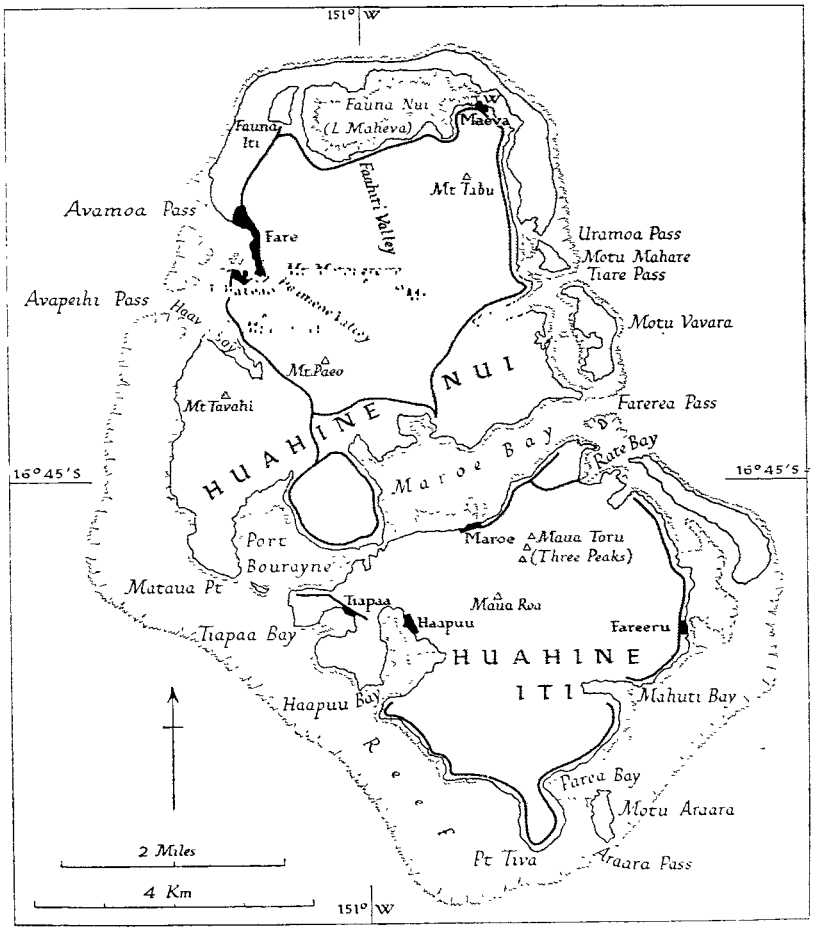


Fig. 47. Huahine: roads and settlements

On north-east side, W indicates position of fish weir traps shown in detail in Fig. 33. Based on same sources as Fig. 46.

deep channel inside the barrier reef. Both are narrow, but have central depths of from 8 to 19 fathoms, are accessible by large vessels at all times, and lead to good anchorages.

The coastline of Huahine is greatly indented by a number of long narrow bays fringed with coral reef, the largest being Maroe bay, on

the east side, about 2½ miles long. This bay and Port Bourayne, on the west side, divide the island, and there is boat communication at high water between them.

Harbours and Landings. The best harbours are Fare (in full, Fare-nui-atea) and Haavai bays, on the north-west of the island, both reached by Avamoa pass or Avapeihi pass. Fare harbour (Plate 41), which is safe for all types of vessels, has anchorage in 10–16 fathoms, on mud, and there is a wharf of coral rock with timber facing, about 300 ft. long, with depths of 11 ft. alongside and 23 ft. and more immediately off it. Haavai harbour (Cook's harbour or Cook's inlet) has anchorage in 10 fathoms. Other harbours are Port Bourayne, on the west side, about a mile long by nearly as much wide, with good anchorage in about 15 fathoms, reached by the channel southward of Avapeihi pass; and Maroe bay, on the east side, reached by Farerea pass, with good extensive anchorage in 12–22 fathoms. Anchorage for small craft may be found in Haapuu bay, rather more than a mile to the south-east of Port Bourayne.

The best landing is at the wharf at Fare harbour, but there is a pier in Maroe bay, and landing from boats is possible in most of the other bays, on the fringing reef. Rise and fall of the tides is rarely more than 1 ft. Water is plentiful from permanent streams and springs. A small water system supplies the village of Fare, and there are several taps along the waterfront.

Vegetation and Fauna

The soil of Huahine is fertile, and the island has a luxuriant vegetation. On the coastal flats there are large plantations of coconut palms and bananas, while pineapple and vanilla are cultivated on the intermediate slopes. The soil is especially favourable to taro and other vegetables. In the mountains inland the flora is of the type characteristic of the high Society islands.

There is little native fauna apart from a few birds; wild pigs and wild fowls are found in the forest.

Social and Economic Conditions

Until the end of the seventeenth century Huahine was occupied by a number of separate clans or kinship groups each under an independent warrior chief. Some time in the first half of the eighteenth century, however, the island passed under the domination of the clan which had its seat at Maeva, on the shore of the lake in the north-east

of the island, a place long sacred because of its fish weir traps and its temples (Fig. 33). Each clan, of which there were historically first eight, and later ten, did not occupy an entirely separate area, but had numerous tracts of land scattered throughout the island, in patchwork fashion. By about 1750 a prince of Raiatea, son of the king of Raiatea and a chieftainess of Huahine, established himself as the ruler of Huahine and founded the dynasty which continued down to the French occupation towards the end of the nineteenth century.

In 1846, the people of Huahine, as one of the independent states of the Leeward islands, resisted by force the attempt of the French to coerce them into acceptance of a protectorate.

In 1931 the total population of the island was 1,283; in 1939 it was estimated at 1,300, including about 300 Chinese and 50 Europeans. The inhabitants live almost entirely on the coastal flats. The principal village is Fare, on the north-west side. This is the residence of the government agent in charge of the island under the authority of the administrator at Raiatea, and has about a dozen Chinese stores. About half a dozen other villages are distributed around the island, mostly in the various bays (Fig. 47). Maeva, on the lagoon in the north-east, has many houses built out on piles over the water. Each small village has a Chinese store.

Huahine is rich in the usual products of the high islands of the group. Copra (about 100 tons per annum), oranges, vanilla and pineapples are exported, and a variety of fruits and vegetables are grown. The lagoons on the north side are famed for the fine fish and crabs they produce. Agriculture and fishing are the primary occupations of the native people, many of the Chinese are engaged in trade, and the Compagnie Immobilière et Agricole de Tahiti has a large plantation on the island.

Communications

In normal times small schooners from Papeete call at Fare weekly, and vessels of the Messageries Maritimes till 1939 used to call occasionally to pick up copra. Local communication is by means of the native canoes or the two or three motor launches owned by Chinese traders.

From Fare a circular road goes round the greater part of Huahine Nui, with an extension southwards to Port Bourayne. It is surfaced with coral rock, and was in fair condition in 1939. There are sections of road round the coast of Huahine Iti, but the circuit is apparently not yet complete.

No air communications with Huahine existed in 1939. It is doubtful if the island is suitable for airfields, though its harbours would probably provide seaplane bases. In 1939, no telephone, telegraph or W/T facilities existed on the island.

RAIATEA

Raiatea with Tahaa (between lat. 16° 34′ and 16° 56′ S; long. 151° 19′ and 151° 34′ W) lies approximately 20 miles west of Huahine. The two islands are together about 23 miles long, with an extreme width of 10 miles. They stand on the one submarine base, and are completely encompassed by a barrier reef, through which there are ten passes, eight leading to the anchorages of Raiatea and two to those of Tahaa. Raiatea is about double the size of Tahaa (Fig. 48).

Physical Geography

Structure

Raiatea, a high island of volcanic origin, is roughly triangular in shape, with its apex to the north. It is mountainous, with a major chain running from north to south, and subsidiary ridges branching off on either side. The highest peak is Mt Teitei (3,389 ft.) in the centre of the island and other peaks along the chain reach 2,500 ft. in altitude. A prominent point on the north side is Tapioi, 968 ft. high, a massive bluff rising above Uturoa (Fig. 50). In the north of the island also is a central plateau, Temehani or Mehani, rising from about 1,000 to 2,000 ft. as it stretches southwards. The surface of the plateau is gently undulating, with open shallow valleys sloping seawards from the central plateau axis and ending in nearly vertical cliffs which fall to coastal flats. In the south-east of the island is a relatively flat roughly circular lowland, Faaroa valley, which is about 2 miles in diameter and surrounded on all sides except the north-east by high serrated ridges with talus slopes at their foot. This valley is clearly an ancient crater. On the north-east side the crater walls are breached by Faaroa bay, while on the south side a dip in the ridge leads to a valley opening into Faatemu bay. Faaroa valley floor averages less than 100 ft. in elevation above sea level, and sluggish streams meander across its central part.

Coast

The coral barrier reef, standing from 1 to 2 miles from the shore, encloses a large space, with much deep water, though this is en-

cumbered with some coral ledges and islets. Except for stretches round the western and southern sides of Raiatea, where there are only boat channels, navigation is possible inside the reef, though at times difficult. But the numerous passes facilitate entry. The shore of the island is fringed by coral reef except in some parts of the deeper bays. These fringing reefs are submerged, increasing in depth from the strand line to nearly 20 ft. In places opposite the mouths of large streams the reefs are covered with sand from 1 to 3 ft. deep.

The coastline is indented by a number of bays, the largest being Faaroa bay on the east side and Faatemu bay on the south. Coastal flats border the island, being at their widest on the northern end.

Passes and Anchorages. Raiatea has eight passes through the barrier reef, and there are several excellent anchorages between the reef and the mainland.

One of the entrances most generally used is Te Avapiti (or Te Avarua) pass, on the east side, which has twin channels. The north channel is about 200 yd. wide, with least depths of 6 fathoms; the south channel is about 150 yd. wide, with depths of about 19 fathoms. Inside this pass there is good anchorage in a depth of 19 fathoms on sand and mud. From the pass vessels may proceed direct to the port of Uturoa; to Tahaa by way of Tahaa pass; or out to sea by way of Motu Tabu pass, immediately to the north of Raiatea, and Rautoanui pass, on the west side.

On the east side, to the south of Te Avapiti pass, is Iriru pass, barely 200 yd. wide, but deep. This leads by a somewhat intricate channel north to Uturoa, or directly into Faaroa bay, a fiord-like inlet about 2 miles long, with good anchorage in 16–18 fathoms. Secure anchorage may also be obtained in Averarahi, Averaiti and Vairahi bays, successively to the north of Faaroa bay. Te Avamoa pass, south of Iriru pass, is deep but narrow; it leads to anchorage in several adjacent bays, of which the principal is Toahiva bay, on which the village of Opoa stands. This bay gives anchorage in the centre in depths of 16–18 fathoms, but small craft may anchor near the village.

On the south side of the island Naonao pass is the only entrance through the reef, but it is suitable only for small craft in fine weather, owing to a bar.

On the western side of the island Punaeroa pass, with a depth of 26 ft. and a width of about 270 yd., leads into extensive anchorage in depths of about 15 fathoms. Toamaro pass, about $2\frac{1}{2}$ miles to the northward, is 160 yd. wide, with a depth of 9 fathoms, and leads into good and safe anchorage inside the reef, and also in Vaiaeho bay.

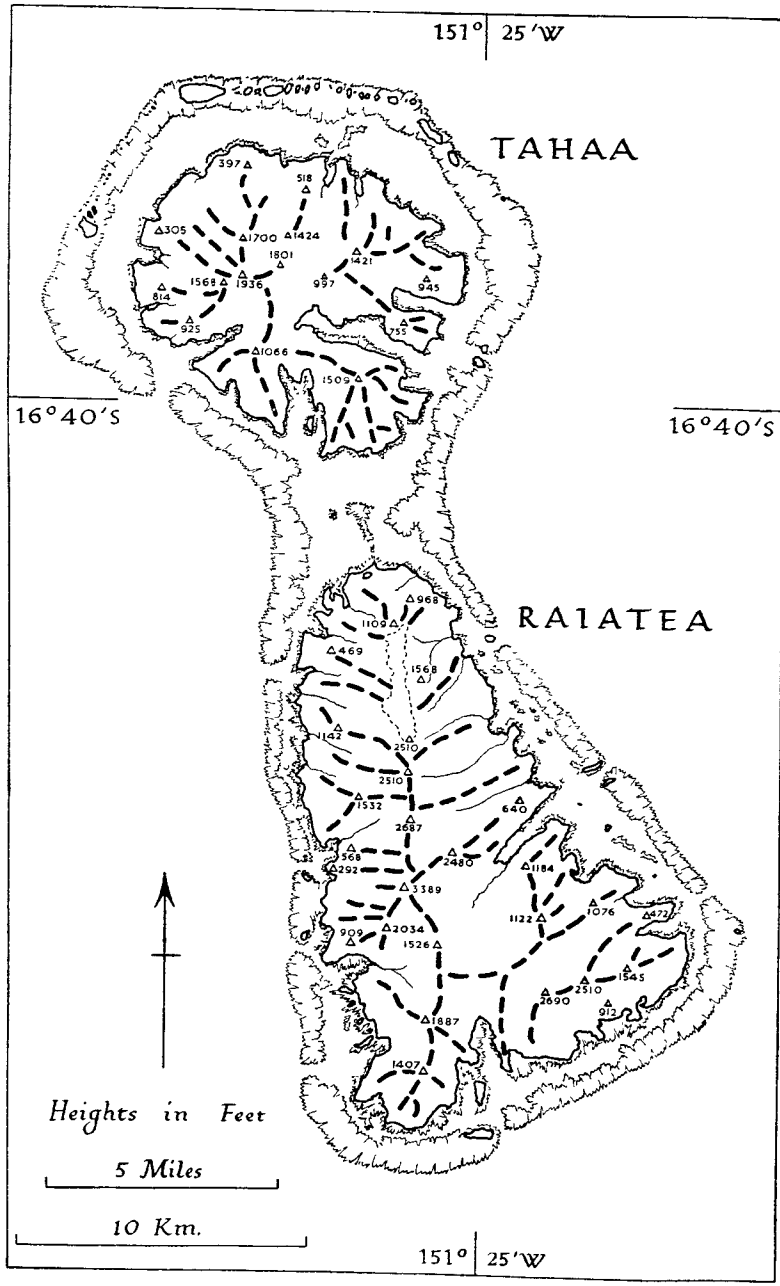


Fig. 48. Raiatea and Tahaa: physical

Based on: (1) Admiralty chart no. 1060; (2) P. Huguenin, *Raiatea la Sacrée*, pp. 20, 24, 27 (Neuchâtel, 1902).

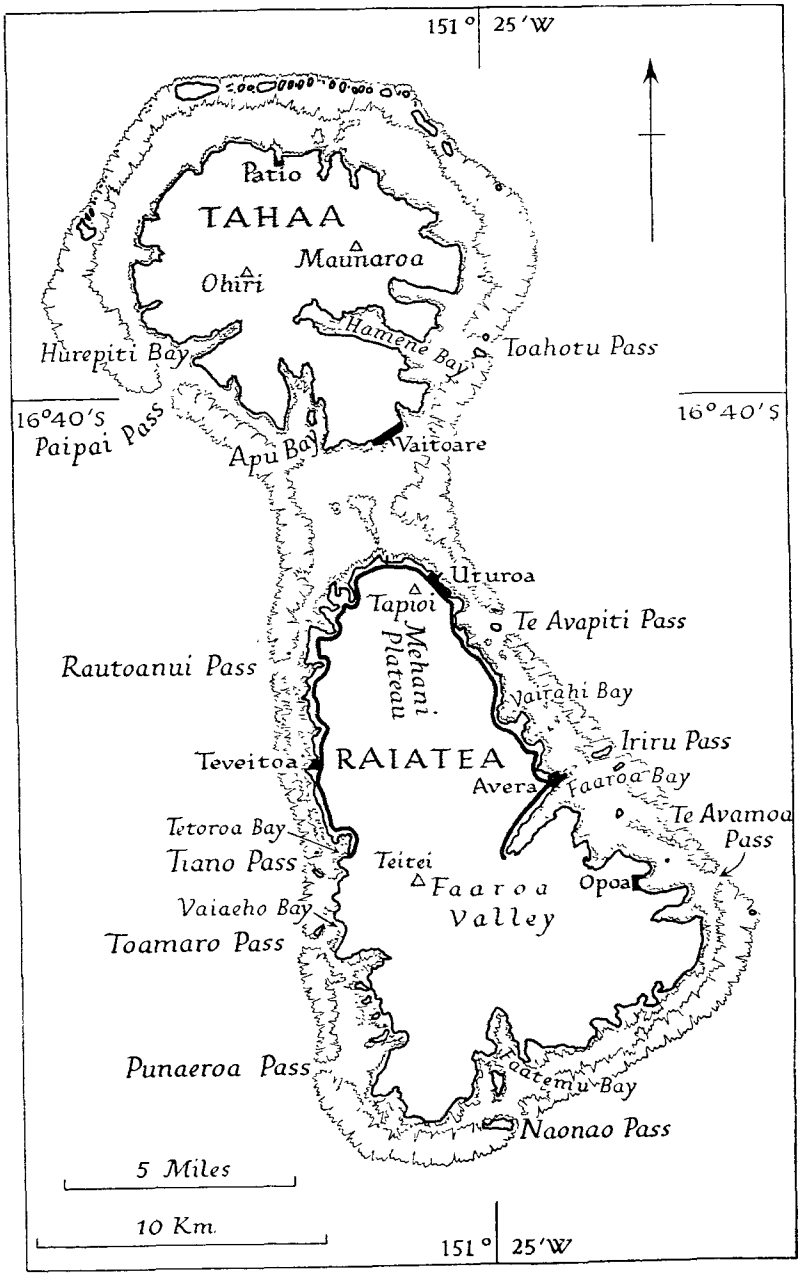


Fig. 49. Raiatea and Tahaa: roads and settlements

Based on the same sources as Fig. 48.



Fig. 50. Raiatea: the north side, from the reef
The settlement of Uturoa lies along the shore. Based on a sketch by P. Huguenin, *Raiatea la Sacrée*, p. 8 (Neuchâtel, 1902).

Tiano pass, farther to the north, is difficult and dangerous; it leads into the cul-de-sac of Tetoroa bay. Rautoanui pass, with a navigable channel rather less than 200 yd. wide and depths of 20–24 fathoms, is most generally used as an outlet in a westerly direction; it leads directly to a very confined anchorage in Pufau bay, close to the eastward.

Ports and Landings. The only port of any size in Raiatea is Uturoa, near the northern end of the eastern side. It has an excellent harbour, suitable for all types of vessels, and a stone pier, 300 ft. long with a timber T-piece at the end, with a depth of 33 ft. alongside. Water is obtainable there from hose connexions. A wooden shed on the south end gives storage for copra. (For other facilities see p. 177.)

Landing can be made in most of the bays round the island, but piers or wharves are few; they include wharves in Vaiaeho bay, Averaiti bay, and in front of the village of Teveitoa, and a pier about half a mile northward of the wharf at Uturoa. Landing elsewhere inside the barrier reef is possible, but only from canoes and launches.

Water Supply

The island is well watered. Streams lead through most of the larger valleys, and many springs on top of the plateau maintain a flow throughout the year. A small water system supplies Uturoa and the vicinity, and is piped to the pier.

Soil

As the land rises gradually from the shore to the foot of the mountains the soil is first sandy and then alluvial, with a mixture of coral, sand and humus. This latter zone, to

an elevation of about 15 ft. above sea level, is very fertile, and is the only inhabited and cultivated part of the island.

Vegetation and Fauna

Coconut palms, *Barringtonia*, *Thespesia* and other trees, cover the coastal flats, and stretch up the broader valleys nearly to the foot of the cliffs. Bananas, pineapples and vanilla are cultivated on the lower slopes, while the uplands and ridges are partly covered in forest and partly in brushwood, including a species of 'sensitive plant'. In the extreme northern part of the island, where there are low hills covered with volcanic fragments, the vegetation consists largely of guava brush and fern brake.

The main forms of animal life are wild pigs and wild fowls, and a few native birds.

Social and Economic Conditions

Raiatea is important in Polynesian history and tradition, particularly for the prestige of its great temple Taputapuatea, situated at Opoa on the south-east side of the island. This was dedicated to Oro, the god of war, and human heads were offered to him there. Raiatea has been famous also as the home of a fire-walking cult, the ceremony of *umu ti*, which is still occasionally performed.

In 1899 the population of Raiatea was 2,138. In 1930 the combined population of Raiatea and Tahaa was 4,307. The estimated population of Raiatea in 1939 was 5,000, of which about 300 were Chinese and 30 were Europeans and Americans.

Uturoa is the only settlement of any size. It is the second largest community in French Oceania, and the administrative centre of the Leeward islands. The village extends for about a mile along the shore, and includes the government offices, a government hospital, a hotel, about twenty Chinese stores and a W/T station. Among the amenities are an electric light plant and a refrigerating plant. There are several other small settlements distributed around the coast (Fig. 49), each with a school house and a Chinese store.

Agriculture and fishing are the chief occupations of the native people, and taro, breadfruit, bananas and other fruit and vegetables are grown for food. Copra, vanilla, pineapples, limes and oranges are cultivated for export, but in recent years the market for them has been affected by high import duties imposed by New Zealand on foreign fruits. A local official estimate of production for Raiatea and Tahaa

together for 1938–9 gives: 5,000 tons of copra, 82 tons of prepared vanilla, 225 tons of green vanilla, and 60,000 pineapples. Before the war it was reported that a French company had established a factory from which orange juice and other products were shipped to Europe. Recently there has been some rearing of cattle for export to Tahiti.

Communications

In 1939 Uturoa was a regular port of call once a month for vessels of Messageries Maritimes, which picked up copra *en route* from New Caledonia to Tahiti. Small schooners from Papeete called at the port about once a week, and there was a fortnightly service maintained by motor launch with Papeete and Huahine.

Local communication is carried on mainly by native canoes and four or five small motor launches, which can make almost a complete circuit of the island in the sheltered water between the barrier reef and the shore. The launches are owned by Chinese traders. In travelling between Raiatea and Tahaa the natives often use large canoes which carry a great press of sail and attain a high speed.

A road, surfaced with shell and coral, runs for rather more than 20 miles round the coast, from Faaroa bay, about the middle of the eastern shore, around the north end of the island to Tetoroa bay. Except in the neighbourhood of Uturoa it is only in fair condition. A few motor cars, some privately owned and some for hire, operate from the port. A few trails lead up into the interior, mainly to facilitate the collection of the wild banana.

In 1939 there were no air facilities at Raiatea, but the island is occasionally visited by a seaplane from Papeete. The lagoon provides good landing and take-off.

There is a W/T station at Uturoa, but no other telegraph or telephone system.

TAHAA

Physical Geography

Tahaa is an island of volcanic origin, essentially circular in outline, with a diameter of about 7 miles. At an earlier geological stage it formed a symmetrical cone, but has now become deeply dissected by broad valleys radiating out from a central mass of peaks and ridges surrounding a central area that was once the ancient crater. The

highest point is Mt Ohiri, towards the western side, with an altitude of 1,936 ft., and there are a number of other peaks over 1,000 ft. high. One of the most notable is Maunaroa (1,421 ft.), towards the eastern side.

The island is entirely surrounded by a barrier reef, continuous with that which surrounds Raiatea.

Coast

The barrier reef is in many places almost awash, but there are about sixty islets on the northern side, many of them wooded. Between the barrier reef and the mainland there is a deep though in parts narrow channel. The coastline of the island itself is deeply indented, two bays in particular, Hamene bay on the south-east side, and Hurepiti bay on the south-west side, extending so far inland as almost to divide the island. The former is about 3 miles long, the latter about $1\frac{1}{2}$ miles long, and each is about $\frac{1}{2}$ mile wide. Coral reefs fringe practically the whole of the coastline. The coastal flats of Tahaa are much narrower than those of Raiatea.

Passes and Anchorage. There are only two navigable passes through the reef, Toahotu pass on the south-east side, and Paipai pass on the south-west side, each being deep and about 300 yd. wide. The former leads to anchorage off Vaitoare (Tahaa village), in 16–22 fathoms on mud, and in Hamene bay; the latter leads also to Vaitoare and to good anchorage in Hurepiti bay (20–25 fathoms) and in Apu bay. The inside passage on the western and northern side of Tahaa is available to vessels with local knowledge, and anchorage can be had in Tapuamu bay and Vaiore bay on the west side of the island, and off the village of Patio, on the north side.

Landing. There is a landing pier at Vaitoare, with 11 ft. of water at its head, a pier to the north of the western entrance point of Apu bay, a wharf at Tiva point near Hurepiti bay, and a boat landing at the head of Hurepiti bay.

Water Supply

The island is less well watered than Raiatea. There are no large streams, but rivulets descend from Ohiri, Maunaroa and other heights. Water is said to be piped to the pier at Vaitoare.

Social and Economic Conditions

In olden days Tahaa was primarily a dependency of Raiatea, but its sovereignty was wrested away from time to time by Borabora, and

it thus became alternately subjected to the neighbouring kingdoms. The culture of the people had no distinctive features.

In 1899 the population of Tahaa was given as 1,099, but in 1939 it was estimated at only about 400, with two Europeans and a number of Chinese. The principal settlement is Vaitoare, with about a dozen Chinese stores. A few other small communities with single rows of houses fringe some of the deeper bays.

Agriculture is restricted by the narrowness of the coastal flats. The production of copra is small, and vanilla is the most important crop. Yams, bananas, arrowroot, breadfruit and sweet potatoes are also grown, and formerly some tobacco and cotton. Fishing is a main occupation of the natives.

Communications

Uturoa on Raiatea serves as the principal port for Tahaa, with Vaitoare as the subsidiary port. Communication is made mainly by small motor launches and native sailing canoes.

The only road on the island is a small stretch of about 1 mile on either side of Vaitoare. There appear to be no vehicles.

There are no air communications, nor are there W/T or other signal communications on the island.

BORABORA

Borabora (approximately lat. 16° 30′ S, long. 151° 45′ W) is strategically the most important island of the Leeward group. Its value lies in its deep and well-sheltered harbour, which offers possibilities also as a seaplane base, and its location athwart the northern and western approaches to Papeete and near the trade routes from Panama to New Zealand and Australia. The island was known in former times as Vavau; it is one of the most picturesque in the Society group.

Physical Geography

Structure (Fig. 51)

Borabora is primarily volcanic in origin, and consists of one large island nearly 6 miles long and $2\frac{1}{2}$ miles wide, with two small islands, Tupua and Tupuaiti, separated from it by a narrow channel. All three are encircled by a barrier reef on which are a number of low islets. The three islands represent eroded remnants of the crater

walls of an ancient volcano. A central mountain chain runs in a curve from north to south along the major axis of the main island, the

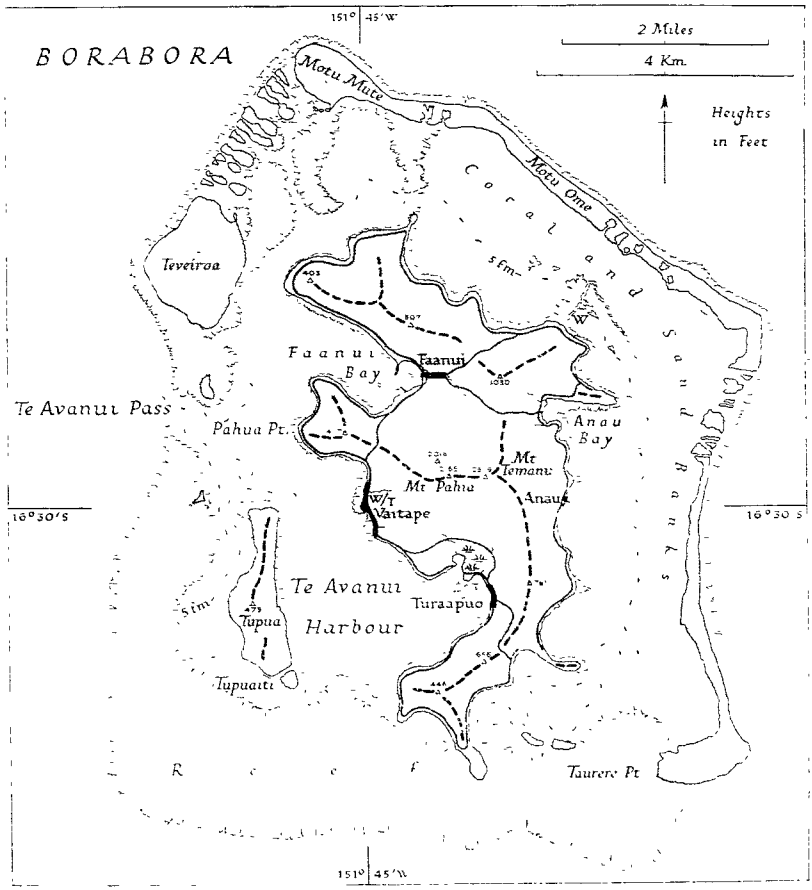


Fig. 51. Borabora

On north-east side W indicates position of fish weir traps shown by L. I. Duperrey, *Voyage autour du Monde...sur la Coquille*, Atlas, carte 5 (Paris 1827); these are marked as fisheries on Admiralty chart, but in the absence of recent records their existence must be regarded as doubtful. Based on: (1) Admiralty chart no. 1428; (2) P. Huguenin, *Raiatea la Sacrée*, p. 28 (Neuchâtel, 1902); (3) K. P. Emory, *Bernice P. Bishop Museum Bulletin*, no. 116, pp. 160–1 (Honolulu, 1933); (4) official sources.

peaks being in general more craggy than those of the other Society islands. The principal points are Mt Temanu (2,379 ft.)., and the double-peaked Mt Pahia (2,165 ft.) (Plate 42). From the former a continuous ridge curving towards the south-west outlines the south-

east rim of the ancient crater, the centre of which lies in the lagoon between Borabora and the small island of Tupua. A peninsula running north from Temanu is also ridge-like in character, but is broken by more extensive erosion into prominent spurs and peaks. The western rim of the ancient crater forms the central ridge of Tupua, reaching a maximum height of 479 ft. in the middle of the island. Tupuaiti, separated from the south of Tupua by a channel less than 2 fathoms deep, is only 50 ft. above sea level at its highest point.

Coast

The islands are completely encircled by a barrier reef, from ¾ to 2 miles in width. On the eastern, northern and north-western sides the reef forms a chain of wooded islets; on the other sides it is awash or submerged to depths of about 10 ft. The lagoon enclosed between it and the islands is deep, especially on the west side.

The coastline of the main island is deeply indented. Of the many bays the principal are Faanui bay and Turaapuo bay on the west side, and Anau bay on the east side; all three are fiord-like, with remarkably straight parallel sides. Fringing reefs surround the shore, rendering access difficult, but there are beaches of sand on the eastern side of Tupua.

Coastal flats run round the greater part of the main island, but they are narrow, ranging from a few yards wide on the northern peninsula to about 200 yd. wide near Turaapuo bay and Faanui bay. Immediately behind them ridges of volcanic rock rise abruptly and lead to the central mountain chain.

Pass and Anchorage. There is only one pass through the barrier reef, on the west side. It is known as Te Avanui (the Great Channel) and is 400 yd. wide and 800 yd. long, with a least depth of about 5 fathoms.

Between Tupua and the main island is a protected and commodious anchorage, Te Avanui harbour, more than 1 mile in length and in width, with depths of 12–16 fathoms. It is one of the best harbours in the Eastern Pacific islands. In 1914 the *Scharnhorst* and the *Gneisenau* made use of it for coaling purposes. Good anchorage may also be had in Faanui bay (Plate 43).

Because of the fringing reef landing on the main island is not convenient except at piers. At Vaitape village landing can be made at a pier of timber, 48 ft. long and 10 ft. wide, projecting from the end of a coral spit; there are 2 fathoms of water off the pier head. At the

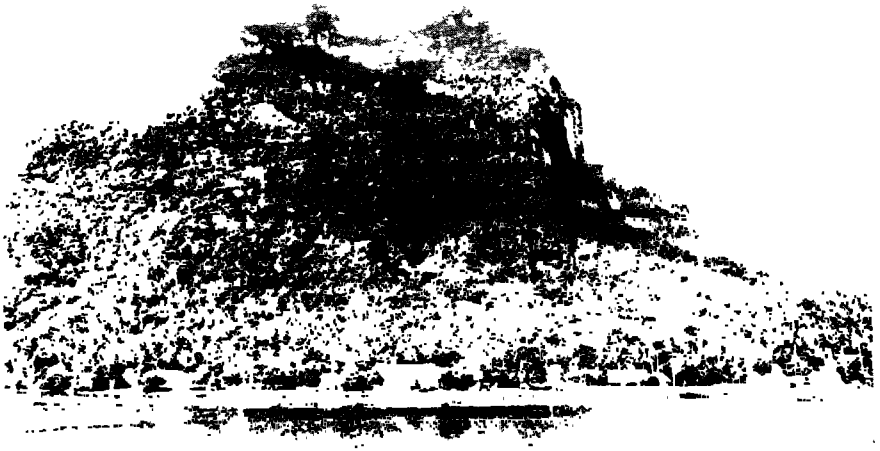


Plate 42. Mt Pahia and Vaitape, Borabora

Viewed from the west. The twin peaks of Mt Pahia are 2,165 ft. (on the right) and 2,018 ft. (on the left). The edge of the fringing reef in front of Vaitape runs left from the jetty.



Plate 43. Faanui bay, Borabora

Looking west from a saddle in the hills on the way to Anau. Reefs and shoals are seen as light patches; the entrance to the harbour lies to the left of the islet. The causeway carrying the coast road across the head of the bay is at the lower right, and to the left of it is the jetty, reaching out to deep water.



Plate 44. West coast of Niau, Tuamotu archipelago

View to the south. The eroded reef with its coral blocks and boulders renders landing difficult at most places.



Plate 45. View on Rangiroa, Tuamotu archipelago

A settlement among the coconut palms, as seen from Tiputa pass (in 1931).

head of Faanui bay a jetty of lava and coral rock, with timber at the end, runs out to the edge of the reef; it is 75 yd. long and 15 ft. wide, with 2 fathoms of water off it.

Climate

The climate of Borabora is in general similar to that of the Society islands as a whole, with a small range of temperature, nights little cooler than the days, and considerable humidity outside the trade wind season. November to March are the warmest and wettest months, and the average annual rainfall is given as 72 in. No full climatic data are available. Hurricanes occasionally strike the island, but they are infrequent in comparison with their occurrence in areas to the south and west. Only ten such destructive visitations were recorded between 1819 and 1906. The most recent hurricane was in January 1941; it caused considerable damage.

Water Supply. Water supply on the island is only moderate. There are no rivers, and the only four streams of any size flow into Faanui, Turaapuo and Anau bays, but even they are apt to be intermittent at some periods of the year. There are many watercourses which fill after heavy rain.

Vaitape village is supplied from the Vaihuna stream which is fed from a rocky peak above the settlement, and yields pure fresh water. A small concrete basin, sedimentation traps and a concrete storage tank of 13,000 gal. capacity have been installed, and an iron pipe carries the water along the beach road, with taps at intervals, and extension to the pier with flow of about 2,500 gal. per day. The villages at Faanui and Anau obtain water directly from local streams and have no distribution systems. Many houses are equipped with outdoor showers.

Vegetation and Fauna

Much of the island is rocky, with little soil covering, though the coastal flats have a loamy mixture of volcanic debris and coral sand. Vegetation is fairly abundant, especially on the west side of the island, but the summits of the mountains have a rather barren appearance. Near sea level and on the lower slopes coconut palm, pandanus, kapok, lime, banyan, oleander, hibiscus and *Calophyllum* are plentiful, while overlapping from the lower to the intermediate slopes there are in addition banana, breadfruit, mango, papaya, ironwood, rosewood, coffee and 'walnut'. Many slopes are devoted to the cultivation of vanilla, manioc and to a less extent pineapple. Orange, candlenut

and 'walnut' are prominent along stream courses and over some of the higher slopes, while on the damp ground at the foot of hillsides and along streams are several varieties of taro and ferns. On the reef islets coconut palms and casuarina (locally called ironwood) are common.

Animal life is scarce. Apart from domestic animals, which include pigs and fowls and a few horses and cattle, the fauna consists mainly of birds. But even these are not common in the forest. There are only about half a dozen species of terrestrial birds, among them being a kingfisher and a small introduced finch. On the lagoon the small frigate bird, the noddy, the large tern, the small fairy tern, the slate blue heron and an occasional wandering tatler (*Totanus incanus*) may be seen.

Insect life is abundant, especially ants and mosquitoes. Centipedes are common.

Social and Economic Conditions

Historically, Borabora occupied a high place in the Society islands culture, being especially noted for its temple Vaiotaha, near Vaitape, and for its Yellow Girdle, a sacred emblem worn by its high chiefs. It is still regarded in all the islands as a principal centre for important family councils on genealogical matters, and in the past it was renowned for its warriors and for its proud record of naval conquests of Raiatea, Tahaa and Maupiti. From the time of French intervention in Tahiti the people of Borabora, fearing annexation of the island, tended to remain aloof from contact with French officials, and to maintain friendly relations with the British, whose influence as missionaries especially had long been felt there. Terii Maevarua II, the last Queen of Borabora, died in Tahiti in 1932. In former times under native rule the island was divided into eight districts, but for recent administrative purposes the number has been reduced to six. The administrative centre is Vaitape, where a French gendarme lives.

In 1939 the population was about 1,300, including about 50 Chinese of all ages, and less than a dozen Europeans. The inhabitants live mostly on the lowlands of the western shore, facing the lagoon. The village of Vaitape comprises several small stores, a school, a church, a small hotel, a small dispensary with beds attached, and about twenty houses. Faanui and Turaapuo, each on the bay of that name, are small communities with a store and a few houses, while Anau, on the east coast, is also small.

The chief occupations of the people are agriculture and fishing. It has been estimated that about 50 % of the daily food of the people is obtained from the lagoon, and the more venturesome fishermen go out beyond the reef to the open sea for bonito and turtle; in recent years shark fishing (for the skins) has become a profitable pursuit. Copra, vanilla and pineapples are prepared for export, pigs are kept, and taro, bananas, breadfruit, etc., cultivated for food. The men of Borabora are skilled craftsmen, their large sailing canoes being famous for their grace of line and beauty of workmanship. Several families carry on the traditions of wood-carving, and their decorated drums, food bowls and model canoes are sold commercially. The women are expert in plaiting and bead-work. The traders and store-keepers on Borabora are all Chinese, who act as agents for the export of copra and vanilla, and supply the small stock of clothing, tinned goods and tools in demand.

Communications

In 1939 small vessels of the Messageries Maritimes and launches of Chinese traders called on the average about once a fortnight to pick up copra. It is not unusual for natives of Borabora to travel by sailing canoe to Maupiti and Raiatea. Local craft include a 75 ft. auxiliary schooner, a 30 ft. sailing schooner, and about 100 native canoes.

A road of shell and coral rock surface runs round the greater part of the island, but accounts of its condition vary. Till the outbreak of war the portion most practicable for motor traffic was the stretch from just north of Faanui to about ½ mile south of Vaitape; elsewhere it was used mainly for bicycle, horse and foot traffic. Its surface was only moderate, and numerous bridges built mainly of coconut palm timbers crossed small swamps or watercourses. Between Vaitape and Faanui there were twenty-three bridges in all, only three having cement culverts. At the head of Faanui bay, opposite the village, the road runs for a little distance on two timber causeways over swampy ground in the bight. Before 1939 there were a very few motor cars and about ten horses.

In 1939 there was no regular air communication with the island, though seaplane anchorage was available near Vaitape pier.

There is no ordinary telegraph or telephone on the island, but a government W/T station communicates with Papeete.

TUBAI

Tubai (approx. 16° 15′ S, 151° 50′ W), of which the ancient name was Motu Iti, is an atoll 8 miles north by west of Borabora. It measures about 4 miles in extent in each direction, and is nowhere more than 30 ft. above sea level. There is no opening through the reef into the lagoon.

The island was formerly a dependency of Borabora, whose people resorted to it for fishing; it is now privately owned, and has been entirely planted with coconut palms, the only inhabitants being labourers engaged in the preparation of copra. The island is a favourite breeding place for sea birds and turtles.

MAUPITI

Maupiti (lat. 16° 27′ S, long. 152° 15′ W) was formerly known also as Maurua. It is situated nearly 30 miles west of Borabora, and is the most westerly of the inhabited Society islands.

Physical Geography

Structure

The island is about $1\frac{1}{2}$ miles long, east and west, and roughly crescent-shaped. Its central mass is built of volcanic rock, the northern remnant of an extinct crater rim, with a little low land round the base on the north-east and south sides. The central mountain, rising to 698 ft., is named Urufaatiu (Figs. 52, 53).

Coast

The island is encircled by a barrier reef, the southern part of which except for a few islets is mostly awash, but the northern part having narrow wooded islets as a land rim. The two largest of these are Auera and Tuanae. The lagoon confined by the reef varies from $\frac{3}{4}$ to $1\frac{3}{4}$ miles in width, and is much encumbered by coral reefs, giving small anchorage space. The entrance, on the south side, is intricate, with depths of 4–6 fathoms, and a strong current setting through it; in bad weather the sea breaks across it, and even in fine weather rollers are common. It is navigable only by schooners and other small craft, but even they often find it impracticable in south-easterly winds. Landing is usually made on the north side of the main island, at Vaitia, but at Farearii, opposite the lagoon entrance, is an ancient

canoe jetty of rough coral and lava blocks, about 150 yd. long and from 4 to 6 ft. wide, with its top about 4 ft. above the level of the lagoon. At this landing can also probably be made. Much of the shore of the island is bordered by a fringing reef, which renders landing elsewhere difficult.

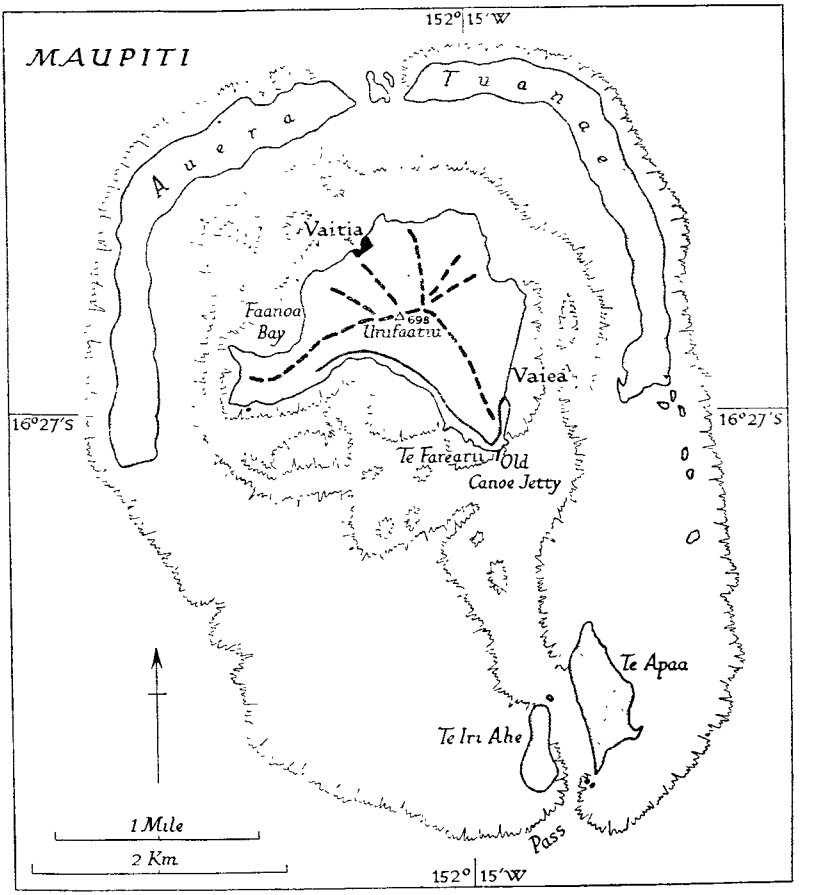


Fig. 52. Maupiti

Based on: (1) Admiralty chart no. 1060; (2) E. S. C. Handy, *Bernice P. Bishop Museum Bulletin*, no. 79, pp. 101–7 (Honolulu, 1930); (3) K. P. Emory, *Bernice P. Bishop Museum Bulletin*, no. 116, pp. 167–8 (Honolulu, 1933).

Climate

In common with the other Society islands, Maupiti enjoys the equable climate of the south-east trade wind zones. There is no

adequate meteorological information from the island, but the prevailing winds are said to be easterly, though perhaps from rather more to the north than at Tahiti. The warmest and wettest months are from December to March. The smallness of the island and the lack of high peaks not only furnish little protection against wind, but also fail to encourage the condensation of moisture, with the result that heavy rain is not frequent.

Water Supply. There are no running streams on the island. Water is obtained from springs and from shallow wells, and is apt to be scarce. In periods of drought the people may have to depend to some extent upon neighbouring islands for food and water.

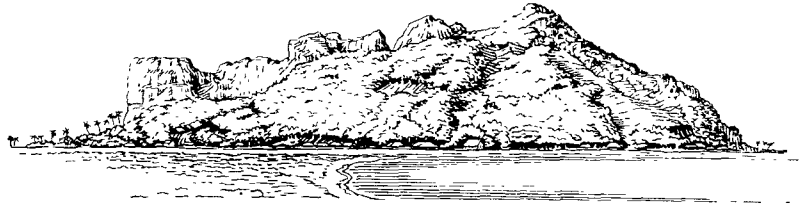


Fig. 53. Maupiti: view of the central island from the reef
Based on a sketch by P. Huguenin, *Raiatea la Sacrée*, p. 30 (Neuchâtel, 1902).

Vegetation

Vegetation consists of coconut palms and brush on the islets, coconut palms and a small area of other cultivated plants on the low land of the main island, and forest of mixed type on the hill slopes.

Social and Economic Conditions

In pre-European times, tiny as the island is, it was divided into eight or nine districts, under the authority of a high chief who lived at Farearii, in the south. The modern house form, as much else of the culture of the people, is of a Raiatea type, but in olden days Maupiti because of its comparative isolation had developed a number of distinctive customs. These included the use of a large gourd attached to the end of a pole to give a better purchase in poling a canoe over the sand or coral of the shallow lagoon floor, and to serve as a paddle if required. At the present time the people have several dialectal variants of the standard Society islands speech.

In former times a continuous stone wall, of blocks 4 ft. high and 3 ft. thick, ran round a great part of the island at a distance of 50–100 yd. from the lagoon, with the object of preventing pigs from going upland to the plantations. In post-missionary times, when the road was built, this wall was broken and shortened.

In 1897 the population of Maupiti was 542. At the census of 1931 the figure was 438, comprising 242 males and 196 females, with no Europeans, but two Chinese of long residence. But in 1939 the estimated population was only 250. The loss has been primarily due to the attraction of young people towards the larger and more developed islands of the Society group. The people now live in one village, Vaitia, on the north side. Vaiea on the east side was formerly a main settlement.

Agriculture and fishing are the main occupations of the people, and small quantities of copra and vanilla are exported. The supply of fruit and vegetables is very limited owing to the comparatively small area of cultivated land. A few wild pigs and chickens are available.

Communications

Small schooners from Papeete call in normal times on an average every three or four weeks. Small launches owned by Chinese traders on Raiatea occasionally call at Vaitia, and canoes belonging to Maupiti natives often make the trip to Borabora, a distance of more than 20 miles.

About 1 mile of road, the quality of which is not known, skirts the south shore of the island.

There is no air service nor any W/T station or other form of signal communication.

MOPIHAA, FENUA URA AND MOTU ONE

These are three small islands, all of atoll formation, and of little importance; they constitute the remotest land of the Society group in a westerly direction. Mopihaa (named Lord Howe island) and Fenua Ura (formerly known as Scilly) were discovered by Wallis in 1767; Motu One (formerly named Bellingshausen) was discovered by Kotzebue in 1824.

Mopihaa (approximately lat. 16° 48′ s, long. 153° 55′ w), lying about 100 miles west-south-west of Maupiti, consists of many low

islands on a reef surrounding a lagoon about 10 miles long and 4 miles wide, with an average depth of 16 fathoms in its northern part, the only one that has been explored. The eastern side of the reef is a long narrow land rim with many coconut palms; the northern and western sides are awash, with many islets, some of them covered in trees and brush. The entrance into the lagoon, on the north-west side, is about 30 yd. wide, but at the inner end is almost closed by coral, so that only a very small vessel may pass. Landing may be made from boats inside the lagoon.

Fenua Ura (approximately lat. 16° 30′ S, long. 154° 40′ W) is a reef of about 7 miles in diameter, on the eastern side of which is a group of small low islets dangerous to shipping. The lagoon has no entrance except a boat passage about half a mile from the north point. Through this landing may be made inside the reef.

Motu One (approximately lat. 15° 48′ S, long. 154° 33′ W) consists of four low coral islets covered in coconut palms and other vegetation, on a reef of triangular form and about 3 miles in greatest length. There is no entrance into the lagoon, but landing can be made in fine weather on the west-north-west side of the reef.

The three islands are owned by the Compagnie Française de Tahiti, and are all planted in coconut palms. They are uninhabited except for occasional labourers engaged in the preparation of copra. It is doubtful if they have any permanent water supply.

There is no regular communication with the islands.

BIBLIOGRAPHICAL NOTE

There are many popular accounts of little value dealing with Tahiti and the Society islands. Among the most useful general works in addition to those cited in Chapter III are: Paul Huguenin, *Raiatea la Sacrée* (Neuchâtel, 1902)—gives an account of the geography and life of the people of each of the Leeward islands; George Calderon (Tihoti), *Tahiti* (London, 1921); C. Ingram, *Isles of the Seven Seas* (London, 1936).

Physical geography and geology are discussed by: Général P. F. Ribourt, 'Observations Géologiques sur Tahiti et les îles basses de l'Archipel des Paumotus', *Bulletin de la Société de Géographie*, 6me série, vol. XVI, pp. 18–40 (Paris, 1878); P. Marshall, 'The Geology of Tahiti', *Proceedings and Transactions of the New Zealand Institute*, vol. XLVII, pp. 361–76 (Wellington, 1914); P. Marshall, 'Notes on the Geology of Moorea and Rurutu Islands', *Proceedings and Transactions of the New Zealand Institute*, vol. XLVI, pp. 281–3 (Wellington, 1913); W. A. Setchell, 'Phytogeographical Notes on Tahiti', *University of California Publications in Botany*, vol. XII, I, Land Vegetation, no. 7 (Berkeley, Cal., 1926); L. J. Chubb and W. C. Smith, 'On the geology of Maiao (Society Islands)', *Quarterly Journal of the Geological Society of London*, vol. LXXXIII, pp. 342–5 (London, 1927); H. Williams, 'Geology of Tahiti, Moorea, etc.', *Bernice P. Bishop Museum Bulletin*, no. 105 (Honolulu, 1933); J. T. Stark and A. L. Howland, 'Geology of Borabora', *Bernice*

P. Bishop Museum Bulletin, no. 169 (Honolulu, 1941); C. Crossland, 'The island of Tahiti', *Geographical Journal*, vol. LXXI, pp. 561–85 (London, Jan.–June 1928).

Coasts are described in: Service Hydrographique de la Marine, *Instructions Nautiques*, no. 363, *Iles de L'Océan Pacifique*, vol. III (Paris, 1933—with supplement, 1942); *Pacific Islands Pilot*, vol. III, 6th ed. (London, 1931—with supplement, 1941); United States Hydrographic Office, *Sailing Directions for the Pacific Islands*, vol. II (Washington, 1940—with supplement, 1942). An analysis of reef structure, with some coastal information, is given by C. Crossland, 'Coral reefs of Tahiti, Moorea and Rarotonga', *Journal of the Linnean Society (Zoology)*, vol. XXXVI, pp. 577–620 (London, 1928). A brief account of the system of lights for the Society islands and other groups is given by M. A. de Rouville, 'Le Développement de la Signalisation Maritime dans les Territoires d'Outre-Mer', *Annales des Ponts et Chaussées, Mémoires*, I^e^ part., fasc. 3, pp. 358–68 (Paris, 1933).

The anthropology of the Polynesian people, mainly in reference to former conditions, is described by H. L. Schapiro, 'The physical characters of the Society Islanders', *Bernice P. Bishop Museum Memoir*, vol. XI, no. 4 (Honolulu, 1930); Teuira Henry, 'Ancient Tahiti', *Bernice P. Bishop Museum Bulletin*, no. 48 (Honolulu, 1928); E. S. C. Handy, 'History and Culture in the Society Islands', *Bernice P. Bishop Museum Bulletin*, no. 79 (Honolulu, 1930); Kenneth P. Emory, 'Stone Remains in the Society Islands', *Bernice P. Bishop Museum Bulletin*, no. 116 (Honolulu, 1933).

For maps see Appendix I.

Chapter V

THE TUAMOTU ARCHIPELAGO

Physical Geography: The People: Administration: Economics: Communications: *Individual Islands*: North-western Islands; Other Islands North of 20° S Lat.; Islands South of 20° S Lat.: Bibliographical Note

The seventy-six islands of the Tuamotu archipelago (excluding those of the Mangareva group, which are linked with some of them for administrative purposes) cover a wide area, between long. 135 and 149° W, and lat. 14 and 23° S (Fig. 54). They were discovered individually by slow degrees and by many different navigators of various nationalities, from the beginning of the seventeenth century to nearly the middle of the nineteenth century. They were annexed to France in 1880.

PHYSICAL GEOGRAPHY

As a former alternative name of the group, the Low archipelago, implies, the islands with the exception of Makatea are flat and low-lying. There is hardly any point on their land surface that is more that 30 ft. above sea level, and most of them are much less, though their vegetation gives them additional apparent height. Nearly all of them are of typical atoll structure, with a long coral reef in the shape of a more or less complete ring enclosing a lagoon. Though the group as a whole extends over such a great area, none of their land masses are of any considerable size. Certain of the lagoons, such as Fakarava, Rangiroa and Hao, have a circuit of nearly 100 miles, but most are only a few miles in circumference, and the atoll rim is usually very narrow, less than half a mile across. The total superficial land area of the whole archipelago is officially 330 sq. miles, but this figure is only approximate, and the area may be much less. Many of the atolls have passes into the lagoons, mostly on the north-west, north or north-east sides, but others are without entrance, even for boats.

From the navigational point of view the archipelago has to be treated with great caution. Because they are so low, with many of the reefs only awash, the islands are dangerous to approach, especially by night. Hence arose the name of Dangerous archipelago applied to them by Bougainville in 1768 and sometimes used on maps since.

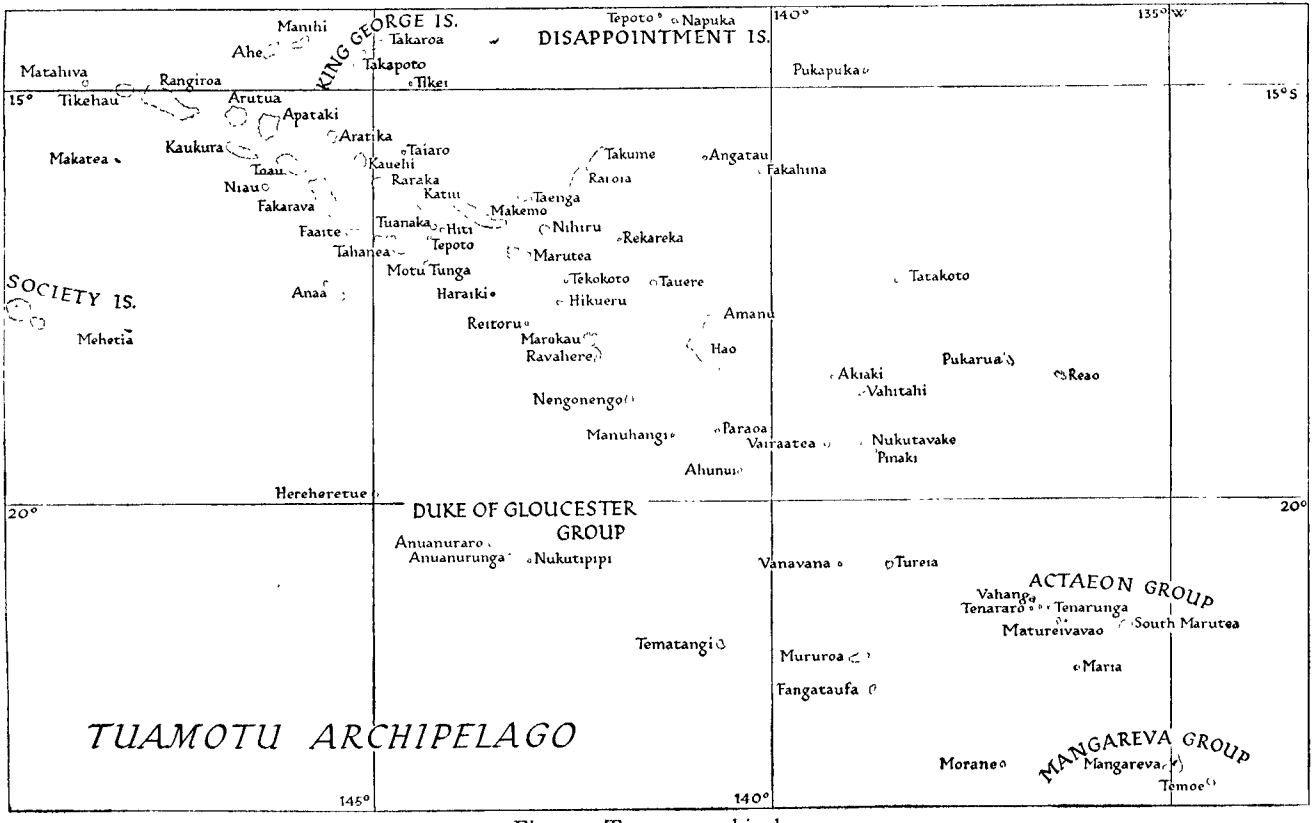


Fig. 54. Tuamotu archipelago

The dotted shapes represent atolls. Based on Admiralty chart no. 767.

In navigating among the group an island is frequently first sighted at dawn, since it is a common practice for a ship to lie off at a safe distance during the night. The island then appears as a low dark line, hardly more clearly defined than the crest of a wave. In a few cases, notably that of Anaa, where there are great shallow lagoons, a curious phenomenon may be seen at daybreak—a greenish glow or reflexion in the sky long before the island itself becomes visible—a kind of atoll-mirage.

Navigation is still further imperilled by the fact that the archipelago has been imperfectly surveyed, and the charts are therefore apt to be defective as regards the position, orientation and coastal detail of the islands. A number of the modern charts are still based on surveys by early voyagers, as the Admiralty chart of Hao on a survey by Captain Beechey of H.M.S. *Blossom* in 1825; the U.S. Hydrographic Office chart of Rangiroa and Tikehau, or the French Service Hydrographique de la Marine charts of Manihi, Ahe and Takaroa on surveys by the United States Exploring Expedition in 1839. Other charts are taken from more recent sketch surveys which are of only approximate accuracy.

Complicating the navigational position still further are the currents of considerable strength which run through the group and in and out of the passes to the lagoons. At times these currents set on to the reefs.

On close approach the aspect of the islands tends to conform to a common pattern. Though in some parts the reef alone is visible as a barrier, in general the coast shows a succession of horizontal bands. First is the outer edge of the shore reef, shown by a creamy white line of surf which may break up as the waves recede to reveal the deeply fissured rugged structure of the coral and other marine formations. Then comes a short stretch of smooth, light-coloured shallow water, with the reef flat perhaps partly exposed if it is low tide, showing a pitted surface with boulders and blocks of old coral scattered here and there. Next follows a belt of dazzling white beach, of coral sand and other detritus; finally, behind the beach rises a dark wall of coconut palms or other vegetation, the top of which stands comparatively evenly against the sky (Plates 44, 45, 46).

Coasts

As will be realized from this description, nowhere in the archipelago with the exception of Makatea are there any very prominent coastal features. The problem is primarily one of negotiating the reefs to find

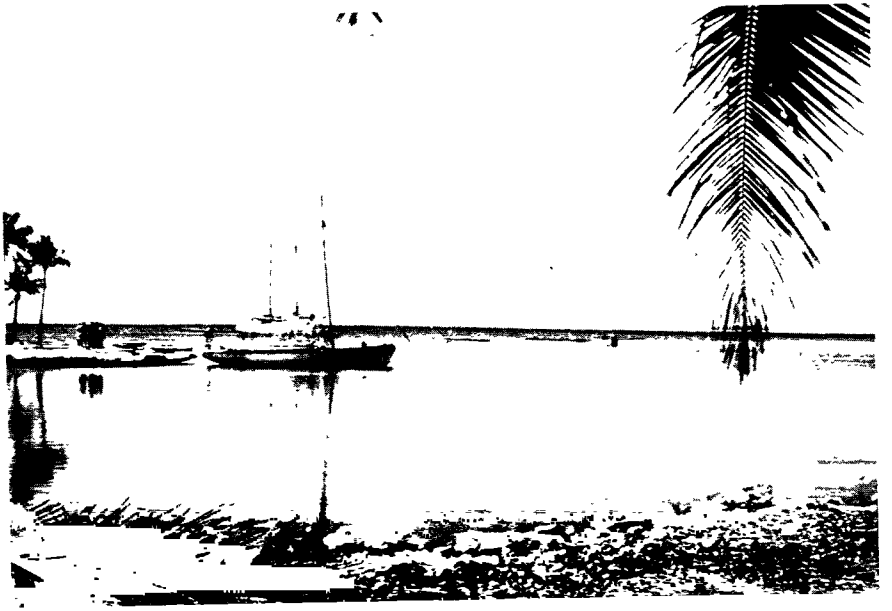


Plate 46. Anchorage at Amanu, Tuamotu archipelago

Typical of a placid lagoon anchorage. Islets on the atoll ring can be faintly seen in the distance.



Plate 47. Village street, Pukarua, Tuamotu archipelago

Houses of this type, built of coral blocks or lath and plaster, with thatch of palm leaf, and set among a thick growth of coconut palms, are characteristic of the better kept Tuamotu villages.



Plate 48. Sea-going boat, Vahitahi, Tuamotu archipelago

These craft incorporate European stylistic features but are built with native technique, including the use of lashings to hold the planks. The boat shown is $23\frac{1}{2}$ ft. long, and has the name 'Tevaoroa ia Raka'.



Plate 49. Limestone cliff face, Makatea, Tuamotu archipelago

Near Temao, on the west side of the island. Showing wave-cut grottoes near the base of the cliff and (in the foreground) wave-cut bench.

anchorage and landing, and the navigator has little in the way of natural features to aid him. Lights and beacons also are few, and for various reasons do not always necessarily correspond to the indications of them given in the *Sailing Directions*.

Anchorage and Landing

There is no harbour that can be properly called a port in the group. Anchorages off the islands are rare, as the outer edge of the reefs usually goes steeply down into deep water. Many of the lagoons have no entrance, and landing must be made on the reef; others have only a boat passage. Within those lagoons which have passes admitting sea-going craft, the best anchorages for large vessels are in Fakarava, Apataki and Makemo; others of lesser quality are in Rangiroa, Raroia, Amanu, Nengonengo, Kauehi, Tahanea, and Toau. For schooners and other small vessels additional useful anchorages are in the lagoons of Takaroa, Tikehau, Hao, Taenga, Katiu, Ahe and Mururoa. Once entry has been gained to the lagoon, landing is usually simple; there are very few piers or jetties but beaches are easy of access, though some wading over reef may be necessary.

CLIMATE

The climate of the Tuamotu group is hot, but with no pronounced variations of temperature. Systematic records, however, are not available. There are two main seasons—a warm season during which most of the rain occurs, lasting approximately from November to April; and a cooler season, lasting from May to October. Average temperatures range from 76 to 81° F.

The trade winds blow over the archipelago throughout the year, but are often disturbed; they are most regular from May to October and then blow freshly. Their mean direction is east, drawing to east-south-east from June to October, and to east-north-east from November to May. At this latter period they are often light, and may alternate with heavy unstable squalls from north to south-west, these squalls being more frequent by night than by day. Strong winds from the south-east are liable to occur from May to September, but especially in August, when they are apt to last from four to eight days. From November to May, gales from north to south-west are relatively frequent, especially in January to March. In January a gale arising in the north-west usually shifts to north and north-east; at other times the tendency is for it to shift from north-west to south-west.

The Tuamotu group is subject to hurricanes, which occur as a rule towards the end of the year, or in January or February. Normally, however, they occur less than once in two years. Hurricanes (tropical cyclones) of particular force have been recorded in September 1877, February 1878, January 1903, and February 1906. In them villages were destroyed and many lives lost; on some islands soil and brushwood were swept away by the sea, leaving bare areas of broken coral.

Water Supply

Scarcity of fresh water is a difficulty throughout the whole group. The porous ground absorbs rainfall, and there are no streams or springs. Wells are scarce, and are apt to have an uncertain flow. In some islands rain water is collected in cisterns, but in others the native inhabitants rely largely on the fresh 'milk' of the coconut for drinking purposes.

Vegetation and Fauna

The soil of these atolls, formed primarily by the disintegration of surface coral, with but a small contribution from decomposed vegetable matter, is only a thin coating, and vegetation is accordingly scanty. Makatea, higher and with more abundant soil cover, is the only exception (cf. p. 207). Coconut palms are prominent on most of the islands, but they are by no means always dominant, and are even lacking on some of the smaller atolls. Historically, human agency has been responsible to a considerable degree for their spread. More fundamental to the vegetation in many of the islands is the pandanus. Large trees apart from these are usually rare, though species of *Pisonia* and *Cordia* occur in the forests of some islands. The former, under its native name of *puka*, has given name to certain islands—Napuka (known to the inhabitants as Te Puka a Maruia) and Pukapuka. Among small trees and shrubs are *Morinda citrifolia*, commonly known for its edible berries, an *Erythrina* (a tree with a conspicuous red flower) and types of hibiscus. The remainder of the vegetation usually comprises a few types of bushes and grasses. In some of the islands introduced plants such as papaya, taro, and melon are grown, but on the whole these are scarce.

Animal life on the islands is rare, consisting, as far as land animals go, mainly of lizards and other small creatures, apart from introduced dogs, cats and poultry. Rats are fairly common. Land birds are

scarce, but there are a number of kinds of sea birds. Fish are plentiful in the lagoons and off the reefs, and sharks and turtle are common.

THE PEOPLE

Population

The total population of the Tuamotu group was 5,724 in 1931, since when no complete figures have been available. Of these people 1,160, many of them Asiatics, were on Makatea; of the remainder, scattered through the various islands, 4,349 were native Polynesians, 202 were Asiatics, mainly Chinese, and 13 were Europeans. Most of the islands are inhabited, but their individual population is apt to be variable, since the people shift from one island to another for pearl diving, or to collect copra from an island ordinarily uninhabited.

General Type

In physical appearance, culture and language, the natives of the Tuamotu group are fairly closely related to the people of Tahiti. In language the chief distinguishing features are the *ng* and *k* sounds, neither of which occur in Tahitian. This is illustrated by the two forms of island names often heard, owing to the frequent contact with Tahiti. Thus Makatea, Kaukura, Rangiroa are the Tuamotu names, while in the Tahitian pronunciation they become Ma'atea, 'Au'ura, and Ra'iroa respectively. (The Tuamotu *ng* is written locally as *g*.)

Prior to the European occupation they appear to have had the normal Polynesian social structure of extended family groups, with chiefs, and a system of land tenure based on membership of the family group as a unit. In most of the islands they still retain ownership of the soil. The political organization, however, seems to have been essentially on a small scale. Two high chiefs divided between them some authority over many of the islands, but there was no overlordship of the group as a whole, despite much warfare, until suzerainty fell to the Pomare family of Tahiti at the beginning of the nineteenth century. Since the people became converts to Christianity, mainly to Roman Catholicism, much of the ancient culture has disappeared.

Regional Differences in Pre-European Times

It has been possible on the basis of history and differences in speech, customs and to some extent in physical type, to divide the Tuamotu natives into eight sections or areas. The western area,

which formerly had Rangiroa, the largest atoll in the archipelago, as its cultural centre, is under strongest influence from the Society islands. The north-western area had Takaroa as its leader; this atoll was formerly the seat of a powerful tribe which dominated all the islands in the vicinity until it was conquered by the warriors of Anaa about 1810. But the Takaroa people still jealously guard records of their history and genealogies. The central area, the largest of all, had three important centres—Fakarava, Anaa and Hao. From the chiefs of Fakarava the men of highest rank in the western Tuamotu atolls trace their lineage, and Pomare I of Tahiti was descended from them on his father's side. But Anaa, with a shallow lagoon almost entirely enclosed with a broad belt of comparatively fertile sandy soil, became more populous and powerful. In 1835 it had not less than 1,500 inhabitants; at the beginning of the nineteenth century the Anaa warriors raided through the archipelago as far to the east as Hao, and even threatened to invade Tahiti. The other five areas, with Napuka, Fangatau, Tatakoto, Reao and Vahitahi as the centres, lie to the east and are smaller, and more isolated. Napuka has developed definite peculiarities of vocabulary, using such words as *maota* for canoe instead of the standard Polynesian *vaka* or *va'a*, and *rotika* for fire instead of a variant of the standard *ahi*. The Vahitahi area is noted for the closeness of relationship of its dialect to that of the New Zealand Maori, and for the manner in which the people have preserved to the present day many of their ancient dances, songs and ceremonies. And although since 1880 the double sailing canoe has been given up in favour of a single canoe with a wide beam, sailing without an outrigger, Vahitahi is the only island in the Tuamotu archipelago to retain essentially the ancient technique of construction. The people of the Tatakoto area also have distinct characteristics; they were the greatest warriors and navigators of the eastern Tuamotu group and their canoes have a raised sternpost similar to that of certain Cook islands craft. The people of the Reao area were until recently among the most primitive of the Tuamotu archipelago, but their young men have been found to be good sailors, and have been employed in numbers on Tahitian schooners. A decade or so ago several hundred Reao people migrated to Mangareva.

Modern Culture

The modern Tuamotu people live in villages, often only one on an atoll, with houses of a simple type, built of plaited coconut or pandanus leaves on a timber framework, and thatched, or occasionally

of timber with an iron roof (Plate 47). Because of the limitations on agriculture their principal economic occupations are the preparation of copra, diving for pearl shell, and fishing.

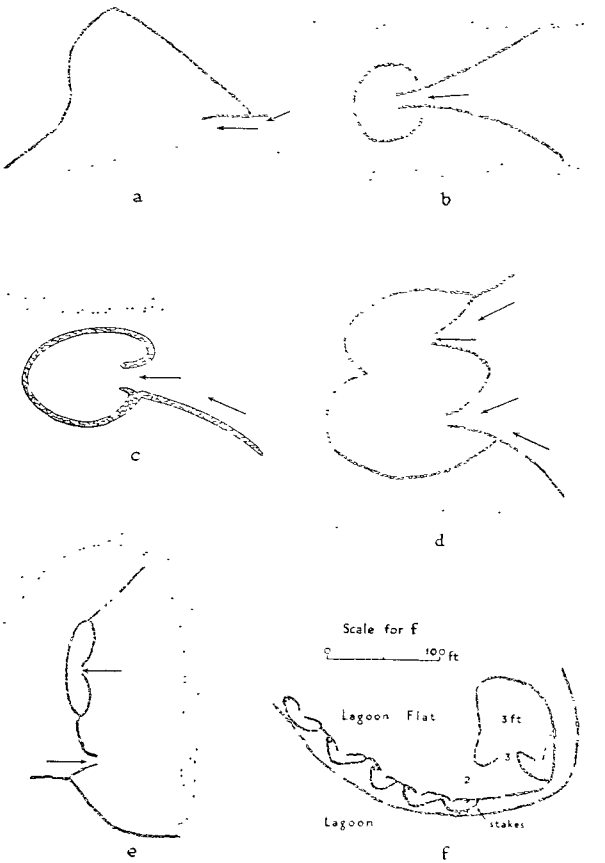


Fig. 55. Types of walled fish weir traps, Tuamotu

Key: *a*, simple enclosure in 1 ft. water, Takapoto; *b*, common type of trap and runway in shallow channel between two islets, Takaroa; *c*, thick-walled trap in 1 ft. water along lagoon shore, Takapoto; *d*, double trap off village, Faaite; *e*, pond-trap with smaller traps incorporated, north side of pass, Hao; *f*, series of traps on lagoon flat near village, Takaroa, with depths of water indicated in feet. Arrows indicate entry of fish on tidal flow; *a–e* are not to scale, but are smaller than *f*. Based on K. P. Emory, *Bernice P. Bishop Museum Bulletin*, no. 118, pp. 24–5 (Honolulu, 1934).

A common feature on many of the atolls are the walled fish weir traps. These occur in the shallows beside the lagoon passes near all villages, in shallow channels between islets, along the shore of the

lagoon, and even on the leeward reef flats where the water attains a depth of 1–2 ft. at full tide. Most of the traps were laid down in ancient times and are kept in repair. Some have walls of a single line of coral stones or fragments; others, more elaborate and more solid, are constructed to a thickness of 2 or 3 ft., and are level along the top; others still are reinforced by heavy stakes driven in along the sides. The simplest types use the shore as one lead or boundary and make a wall for the other, while more complicated types use walls extensively, and may have secondary traps within them, utilizing natural features as rocks and old shell heaps to advantage (Fig. 55). The traps are so designed and placed that the fish following along with the current are led into enclosures from which they do not readily escape until taken with net or spear. Some traps are designed to take advantage of the incoming tide, others for the waters flowing from the lagoon at low tide. These weirs in former times were hereditary family property, and no one might take fish from them without permission. To-day, though they are privately owned, anyone may take fish from them, but if he damages the weir in so doing and does not repair it the owner makes trouble.

The Tuamotu people are all nominally Christian, and belong to three main sects: Roman Catholic, *Kanito* (an Adventist church) and Mormon. In 1900, by calculation from official figures, about 75 % were Catholic, 20 % *Kanito* and 3 % Mormon. But while the Catholics were predominant in the eastern part of the archipelago, their numbers were probably over-estimated. The number of Mormons especially has probably increased in recent years; by 1912 most of the people of Kaukura, Niau and Takaroa belonged to this sect.

Archaeology

The Tuamotu group is of considerable archaeological interest owing to the numerous remains of ancient stone structures found there. These, known by the usual Polynesian name of *marae*, consist of low walls or terraces of coral blocks, often surmounted by erect flat slabs; they formerly served as temples for the religious cults of the people. The slabs were emblems or seating-places of the gods, and before them offerings of first-fruits and other food were laid, and ritual feasts were held. In some cases, though rarely, a human sacrifice took place there (Fig. 56).



Fig. 56. Terrace of the ancient temple Puarautonga on Reao

The remains of this temple are on the north-east side of the atoll, near the shore. View from the south. Offerings were laid before the erect slabs, which represented the gods. Based on a photograph in K. P. Emory, *Bernice P. Bishop Museum Bulletin*, no. 118, plate 9 A (Honolulu, 1934).

ADMINISTRATION

From the administrative point of view the Tuamotu archipelago as a whole does not form a unit, but is split into two areas. The western section is known as the Tuamotu administration; the eastern, included with which is the Mangareva group, is known as the Gambier administration. The approximate dividing line is the 142nd meridian west of Paris (140th west of Greenwich), but Pukapuka (approximately 138° 50′ W) is attached to the Tuamotu administration, while Tematangi (approximately 140° 40′ W) is attached to the Gambier administration. Moreover, Makatea, in the west of the archipelago, has been included since 1911 under the administration of the Society islands on account of the importance of its phosphate exports.

The Tuamotu administration is controlled by a French Administrator, who is also in charge of the Gambier administration, where he is represented by a gendarme stationed at Rikitea in the Mangareva group. He has judicial as well as administrative functions. The administrative centre of the Tuamotu area was formerly at Rotoava, on the atoll of Fakarava. It was transferred in 1933 to Apataki atoll, but has been recently moved to Tahiti during the war. Even before the war the Administrator was not always resident in the group; he lived in Tahiti, paying periodic visits by auxiliary schooner.

The natives of the Tuamotu administration are French citizens, with the right to vote. They are represented in the Economic and

Financial Delegations by a member of their district councils. The natives of the Gambier administration, however, are not citizens but subjects of France, and they are represented in the Delegations by the Administrator.

Local government in the area is in the hands of the natives, subject to supervision from Tahiti. The Tuamotu administration is divided into districts, each usually consisting of one to four islands, though Fakarava, Anaa and Rangiroa are subdivided on account of their size. There are about thirty of these districts in all in the administration. Authority is exercised in each district by the district council, usually consisting of a native chief and about five other men. They act as a court for petty offences, and generally supervise the sanitation of the villages, the co-operative marketing of copra where this occurs, and other social affairs.

Social services are comparatively undeveloped. Education is confined to a number of primary schools, instruction being provided largely by the missions. Many of the natives can read and write Tahitian, but a knowledge of French is not widespread. Trained medical attention is almost wholly lacking, though Reao has recently been constituted the leprosarium for the archipelago, all known lepers being transported there in 1936.

ECONOMICS

The resources of the Tuamotu group are scanty. There are no minerals properly speaking, though phosphate is extracted from Makatea, and represents a very important item of export from the colony of French Oceania as a whole (see pp. 119–20). Phosphate deposits of small amount and poor quality exist on Niau, but have not been exploited.

Agriculture

The shallow soil covering restricts agriculture. Taro, bananas and a few other tropical foodstuffs are grown on some of the islands, but do not flourish as they do in other tropical regions with more fertile soil and greater rainfall. Taro was formerly grown on more Tuamotu islands than at present, as shown by the trenches (dug as garden beds to conserve moisture) on Anaa, Fangatau, Tikei and other atolls. On Reao and Pukarua such trenches are still in use. Owing to the poverty of other vegetable foods, coconut and pandanus tend to be

the staples, though imported wheat flour and rice are used when income permits, and on a few of the islands Chinese bake and sell bread. The pandanus was formerly much more important in some of the islands as a food product than it is nowadays, but the fleshy phalange of its drupe is still eaten, and in some remote islands, as Vahitahi, the kernels are eaten as well.

The manufacture of copra is one of the major occupations of the people. The copra is sold either to trading schooners or to the local Chinese traders, but of recent years there has been a tendency towards the formation of native co-operative associations for the handling of the copra in bulk and the elimination of the middleman. Some communities own their own schooners for taking copra and other produce to Papeete. The proceeds from the sale are normally divided on a communal basis. During the economic depression the fall in the price of copra reduced income and led to some decrease in production. On the whole, agriculture tends to receive more attention in the western islands of the group, partly owing to slightly more favourable conditions, but partly also, as in the case of Rangiroa, owing to large numbers of sharks in the lagoons, rendering diving for pearl shell more than usually hazardous.

Fishing

In contrast to the limited agriculture, fishing is well developed. The ramifications of the reef waters offer an abundance of fish, taken by hook and line or with spears, as well as in the fish weir traps already described (p. 200). Octopus are speared, and turtle are manœuvred ashore by hand or taken by a line with a large hook. Shellfish are gathered from the reef, and some of the shallow lagoons, as at Napuka and Vahitahi, are dotted with tiny islets built up in the course of time by depositing the discarded shells of the giant clam (*Tridacna*) in heaps on shoals.

A drawback to fishing in the Tuamotu islands, however, is that fish in some of the lagoons are poisonous. It has been suggested that this may be due to particular types of algae which they consume, since only certain species in a lagoon, and then not all fish of these species, but only those taken in certain parts, are dangerous as food. The lagoons generally cited in this connexion are Manihi, Apataki, Toau, North Marutea and South Marutea, Aratika, Fakarava, Mururoa and Maria. No sure indication for discrimination can be given, so local advice should be followed.

Diving for Pearl Shell

From the economic point of view the lagoons provide valuable resources through being a natural home for the pearl oyster, though in recent years reduction in the demand for pearl shell, and competition from cultured pearls, have lessened exploitation. The oysters are brought up from the beds by diving. But even when the diving industry was still profitable it suffered considerable fluctuations. The native diver, using only his outrigger canoe, diving goggles and a simple glass-bottomed vessel through which he scrutinizes the floor of the lagoon, is limited by his simple technique; the introduction of mechanical diving apparatus, however, threatened the lagoons with depletion of their resources. The French government therefore declared a close season, and as the pearl shell takes three years to arrive at its commercial state, different island groups have been opened in rotation on a triennial cycle. In recent years no diving machines have been allowed. The primary product is the pearl shell; pearls are produced in only a small proportion of the oysters, and their discovery is a matter of chance. The more important pearl shell fishing lagoons are in Takume, Takaroa, Takapoto, Makemo, Manihi, Arutua, Raroia, Kaukura, Marokau, Hao and Apataki. The pearl shell is sold to local traders, who take it to Papeete, where the scaly outer coating is chipped off by women, and the clean product packed in barrels for shipment to European and American buyers. The pearls are bought by dealers who follow the diving seasons from one island to another. (For quantities exported see p. 119 and Fig. 30.)

COMMUNICATIONS

The only definite sea communication of the Tuamotu islands with the outside world is with Papeete, whence an auxiliary schooner comes irregularly once or twice a month to Fakarava and some of the other principal islands. Makatea, however, is visited by vessels which load phosphate. Within the archipelago itself communication is usually by means of small schooners, carrying both native passengers and copra; these craft may also visit Papeete.

Roads are almost non-existent on the islands, and the small stretches in being carry almost no vehicular traffic.

Normally there are no air services to the Tuamotu group. The lagoons, however, offer a large number of possible landing-places for

seaplanes, and there is a mooring buoy for seaplanes at Fakarava, near Rotoava.

There are no telegraph or telephone communications in the group, apart from the W/T station at Vaitepaoa, on Makatea, maintained by the phosphate company.

INDIVIDUAL ISLANDS

The islands of the Tuamotu archipelago are so scattered that it is difficult to describe them in any simple logical order. For convenience of treatment they are here dealt with in three sections. The division is somewhat arbitrary, but is based roughly upon their order of importance. The sections are as follows: First, the islands in the north-west of the group. These are nearest to Tahiti and are in general of the greatest economic and social interest. Beginning with Makatea, the most valuable from the economic point of view and standing somewhat apart from the others, Fakarava, the former administrative centre, is next described, and then the islands to the north and north-west of it. Secondly, the main body of the archipelago north of 20° S lat., beginning with Reao, the most easterly island. Thirdly, the small and comparatively unimportant islands below 20° S lat., beginning with South Marutea, the most easterly.

NORTH-WESTERN ISLANDS

MAKATEA

Makatea (Aurora island, lat. 16° 10′ S, long. 148° 14′ W) lies about 120 miles north-east of Tahiti. It was probably sighted by Quiros in 1606, and was visited by Roggeveen in 1722.

Structure (Fig. 57)

The island, unlike the majority of the Tuamotu group, is of upheaved coral formation. It is crescent-shaped, about 5 miles long and 2 miles wide, and its plateau-like surface has a general elevation of from 190 to 220 ft. The highest point, Putiare, 372 ft. above sea level, is at the northern end, and towards the centre of the island is a depression of considerable area. The unusual relief is due to the atoll of which the island was originally formed having been thrust up from the sea floor in successive stages, thus slowly emptying the waters

from the ancient lagoon (Fig. 58). The island is everywhere bordered by cliffs (Plate 49), at the foot of which is a narrow fringing reef, with short stretches of white sandy beach on the west and on the east sides. There is no barrier reef. The beach on the west side,

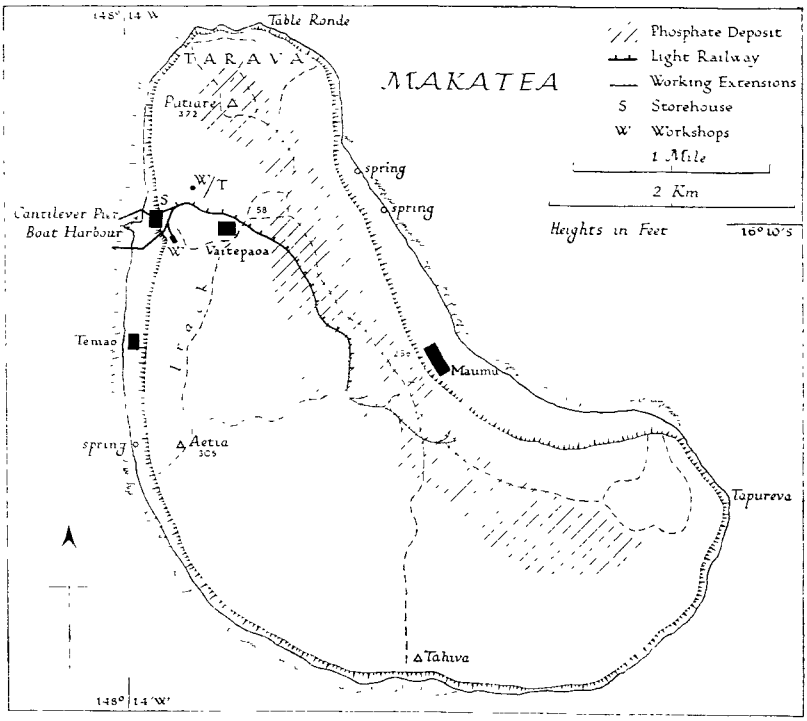


Fig. 57. Makatea

For general key to symbols see p. 8. The map is a composite sketch plan; authorities differ on many details. The area of phosphate deposits and the railway, with its working extensions, are shown as they were about 1930. Based on: (1) Admiralty chart no. 3664; (2) French Admiralty chart no. 3577; (3) survey by P. E. Beverley, 1930–2 (unpublished); (4) K. P. Emory, *Bernice P. Bishop Museum Bulletin*, no. 118, p. 27 (Honolulu, 1934); (5) G. P. Wilder, *Bernice P. Bishop Museum Bulletin*, no. 120, p. 4 (Honolulu, 1934); (6) K. Elschner, *Corallogene Phosphat-Inseln Austral-Oceaniens und ihre Produkte*, Tafel 13 (Lübeck, 1913).

where there is the main landing-place, is about 500 ft. wide at the broadest, and narrows gradually to the north and the south, so that it is impossible to walk round the island at sea level.

Landing

From the nature of the island facilities for landing are not good, and there is no proper harbour. In the bay near Maumu village

landing is always bad, and native canoes are best used. Near Temao there is a cantilever pier 435 ft. long, used for loading phosphate. There is no anchorage, but as at Nauru and Ocean island, mooring buoys have been laid down. There are four of these, but they are not secure in onshore winds. The phosphate is shipped in large baskets brought off in lighters, of $4\frac{1}{2}$–6 tons capacity, towed by two motor boats. A boat harbour with a depth of 5 ft. is situated under the pier (Plate 50).

Climate

The climate of Makatea is hot and humid, but the nights are cool. The heat is tempered in the south-east trades, and frequent showers promote the growth of vegetation. Hurricanes are rare, but occasional strong winds or squalls of gale force from the west suspend shipping and sometimes do damage.

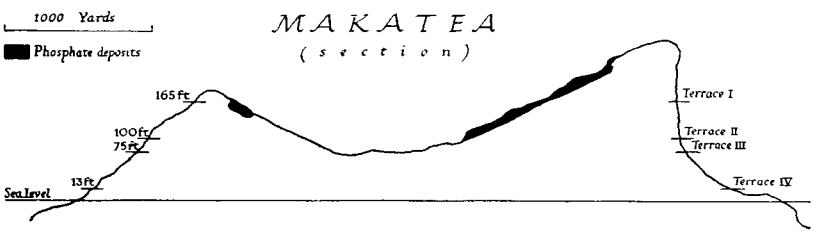


Fig. 58. Makatea: section

Vertical scale exaggerated $12\frac{1}{2}$ times; height of terraces approximate. Section from right to left apparently north-south through Maumu. Based on K. Elschner, *Corallogene Phosphat-Inseln Austral-Oceaniens*, Tafel 14 (Lübeck, 1913).

Water is fairly plentiful on the island; in the rainy season springs flow from the base of the cliffs in several places, and one has been led into a pipe-line and pumped into tanks for use at Temao on the west coast.

Vegetation

The flora has been greatly modified by introductions from the Society islands. It displays comparatively few species, nearly all of which are found also in Tahiti. On the beaches there is some growth of coconut palm, hibiscus and a sparse cover of grasses and herbs, while at the base of the cliffs, where there is some organic matter, gardenia, pandanus, *Calophyllum inophyllum*, *Thespesia populnea*, *Cordia subcordata*, *Morinda citrifolia* and other trees are found, with also some cultivated arrowroot and breadfruit. In swampy places

made by excavation giant taro and manioc are grown. On the plateau there is a luxuriant growth. Pandanus, hisbiscus, banyan, coconut and other trees are common, while at the north end there is a forest of the large *Barringtonia asiatica*. Papaya, breadfruit, vanilla and pineapple are cultivated there. The fauna comprises a few native land birds, including some fruit-eating pigeons and herons. Land crabs are plentiful.

Phosphate

The island is notable for its large deposits of phosphate rock in the interior, occurring in places in beds nearly 40 ft. thick. The quality of the deposit is of a high grade, containing about 85 % of tricalcium phosphate. The deposits have been worked since 1908 by the Compagnie Française des Phosphates de l'Océanie, with French and British shareholders. The managerial and technical staff are French, the labourers Chinese, Annamites and Japanese, with a few local natives.

The phosphate deposits of Makatea are relatively small compared with those on Nauru and Ocean island—an estimate of 10 million tons has been given for Makatea as against 20 million tons for Ocean island and 90 million tons for Nauru. Like all phosphates from the Pacific, however, those of Makatea because of their high quality can compete in Europe with American phosphates, despite the heavier freight charges. These deposits are therefore among the most important assets of the French islands in the Pacific.

The amount exported has varied considerably owing to changes in world economic conditions (Fig. 29). Since recovering from the depression of 1931–3, however, the export has averaged about 120,000 tons per annum, and recently, especially after the destruction of the loading facilities of Nauru, the figure has risen considerably. Australia and New Zealand are prominent buyers, as also was Japan in recent years before the war.

Settlement

The population of the island varies with the commercial prospects for phosphate. In 1936, a moderately slack period, there were 992 people on the island, of whom roughly two-thirds were local natives. There are three settlements. Vaitepaoa, the European settlement, is on high ground to the north-west; Temao, where most of the labourers live, is on the western shore at the base of the cliffs; and Maumu

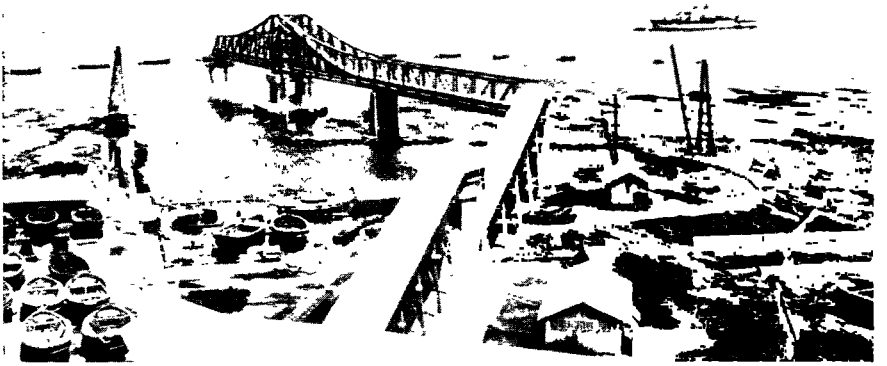


Plate 50. Phosphate loading equipment, Makatea

The phosphate is dumped from the cantilever pier into lighters, which convey it to vessels lying at mooring buoys. A boat harbour has been cut out of the reef alongside and behind the pier.



Plate 51. Phosphate railway, Makatea

The engine pulls small trucks to the head of an elevator at the top of the cliffs above Temao. The pockets in the limestone are exposed by the removal of phosphate.



Plate 52. Mt Duff, Mangareva

This peak, 1,427 ft. high, is the most conspicuous point on the island. The principal settlement, Rikitea, lies in the grove of trees showing as a dark patch on the extreme right.



Plate 53. Avera bay, Rurutu, Austral islands

The bay gives anchorage in the trade winds; a boat passage through the reef is seen in the centre.

(or Moumu), inhabited by the natives of the island, is on the eastern side, also on the shore.

The workshops, laboratories, etc. of the company (including a well-equipped repair shop) are near the cliffs at Vaitepaoa; close to Temao is the shipping port, with storage warehouses of a capacity of about 45,000 metric tons, and boats and launches drawn up above the beach when not in use.

Communication

Steamer communication exists in normal times with Tahiti, twice monthly. In addition vessels from foreign ports call irregularly to load phosphate.

From the pier an elevator 600 ft. long runs up the cliffs to the plateau, and as well as carrying the phosphate in trucks it affords communication for the inhabitants of the island. In its turn this elevator connects with a narrow-gauge light railway which runs for several miles through the phosphate fields. Working extensions of this railway (of which a set is shown on the map as they were about 1930) tend to follow the trend of the deposits actually being exploited at any given time (Plate 51).

Several miles of tracks (Fig. 57) connect up the principal points on the island, and between Vaitepaoa and Maumu this track is perhaps sufficiently well developed to be called a road. It is used mainly by foot and horse traffic, though little two-wheeled horse-drawn carts have been stated to be sometimes employed, and bicycles are now in common use by the younger people. Access from the plateau to the beach, however, is checked by the cliffs, and a staircase with about 600 steps has been cut through the ancient atoll crown of coral rock to lead from Maumu to the plateau on the eastern side.

There is a W/T station, owned by the phosphate company, near Vaitepaoa. No information about telegraph or telephone is available, but it is probable that they do not exist.

FAKARAVA

Fakarava (lat. 16° 02′ S, long. 145° 36′ W), formerly known as Wittgenstein, was discovered by Bellingshausen in 1819. It is an atoll of rectangular shape, about 40 miles long and 15 miles broad, lying about 250 miles east-north-east of Papeete.

The land rim consists of several long stretches and a number of islets, on the northern, eastern and southern sides, mostly well wooded with coconut palms. The western side of the atoll is bare reef (Fig. 59).

There are three entrances into the lagoon. The best is Ngarue pass, on the north side, more than half a mile wide with a depth of 5 fathoms; it is suitable for large

vessels, and is the most adequate pass in the Tuamotu group. Tumakohua pass, on the south side of the atoll, though deep, is intricate. The third entrance, on the south-east, is suitable only for boat landing. The lagoon has few dangers, and affords good anchorage. Rotoava anchorage is situated about 5½ miles to the eastward of Ngarue pass, near the village. It is spacious, with good holding ground, and gives excellent shelter from most winds, though with winds between south-

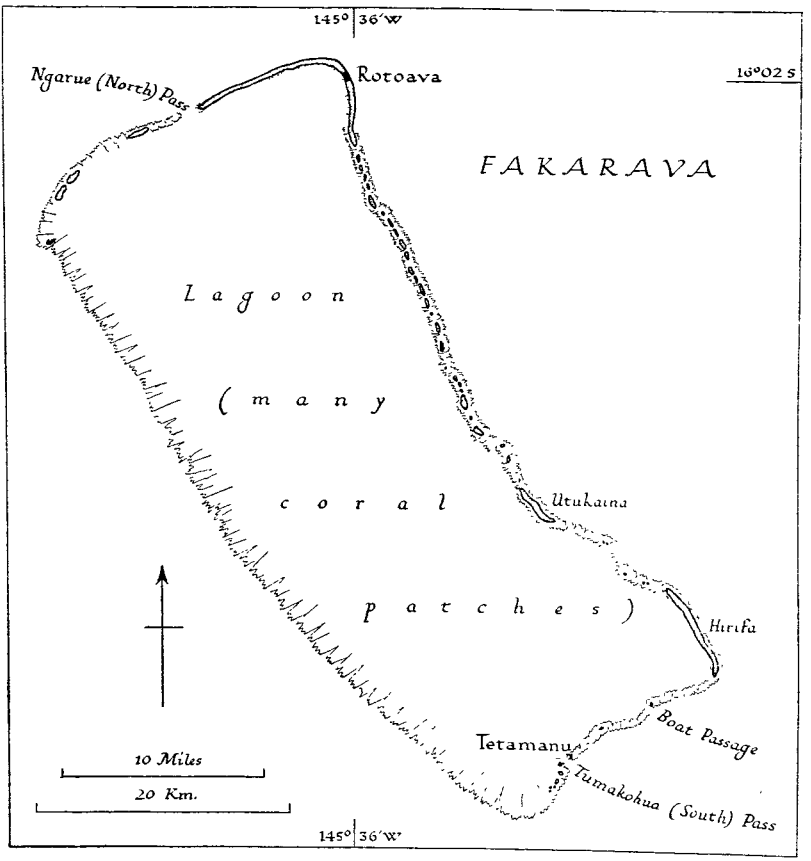


Fig. 59. Fakarava

Based on U.S.H.O. chart no. 2063.

south-east and west-south-west the sea is heavy. Anchorage is available for small craft in 7–10 fathoms, and for larger vessels in greater depths. There is a pier at the village, used by sailing craft. At the south end of the atoll there is also anchorage, north-west of the village of Tetamanu, in about 6–8 fathoms.

The population of the atoll is small, being divided between Rotoava village (formerly the headquarters of the government of the Tuamotu administration) with about 80 people, and Tetamanu village, with about 100 people.

Water is provided by a government cistern holding about 100 tons. Rotoava offers an excellent seaplane and tender anchorage, and a mooring buoy for seaplanes has been laid near the village.

Aratika

Aratika is a triangular atoll about 27 miles north of Fakarava. It was discovered by Roggeveen in 1722, and was named Karlshoff by Kotzebue on his second voyage. The northern part is thickly wooded. The atoll is not permanently inhabited, but is visited by people from Kauehi, about 25 miles to the south-east. There are two entrances to the lagoon, Tetamanu pass on the east side and Temaketa pass on the west side; both are bad and fit only for small craft.

Toau

Toau (formerly known as Elizabeth) is an atoll 23 miles long, about 28 miles south-west of Aratika. It is inhabited occasionally by people from Fakarava. There are two passes into the lagoon, on the north-east side. Nepo pass is suitable only for small sailing vessels. Otuni pass, the eastern of the two, is wide, clear, and 22–26 ft. deep, but the anchorage in the lagoon is not good. Amyot bay, a confined and shallow anchorage said to give shelter from all winds, is on the outer side of the barrier reef, to the north-west.

Niau

Niau (formerly known as Greig), situated about 18 miles south-west of Toau, is an atoll, but is higher than most, being about 26 ft. above the sea. It was discovered by Quiros in 1606, but was named by Bellingshausen in 1819. It is elliptical in shape, about 6 miles long by about 5 miles in greatest width, with a fringing reef, and a lagoon which has no communication with the sea. The water of the lagoon is brackish, and no growing coral has been observed there; its greatest depth is about 8 fathoms. On the atoll rim, which varies up to about a mile in breadth, there is a narrow belt of swampy land just inside the lagoon shore.

Fairly good landing on the island is obtained at the village of Tupana, on the north-east side. But a sandy beach on the west side, near the old village of Ofare, whence there is a good road to Tupana, offers better landing (Plate 44).

The island enjoys rather more natural resources than most others of the Tuamotu group, though it carries only a small population. Both the atoll rim and the lagoon floor carry deposits of phosphate, and the Compagnie des Phosphates de l'Océanie holds a concession over the island. But the deposits, which are sporadic and of poor quality, have not been exploited. Fresh water is plentiful, and Niau approximates rather more closely in character to the high islands than do most others of the archipelago, in that it supports a fairly wide range of cultivated plants. Oranges, limes, bananas and even breadfruit are fairly plentiful, and the coconut palm is abundant. About 1910 the export of copra was about 100 tons per annum, and could have been increased; this despite the devastation wrought by the hurricane of 1878. In the lagoon are excellent fish, resembling salmon.

King George islands

The King George islands consist of two atolls, Takaroa and Takapoto, lying about 5 miles apart, about 48 miles north-north-east of Aratika. They were named by Byron in 1765, but Takaroa was seen by Roggeveen in 1722, and it is possible that they were discovered by Le Maire and Schouten in 1616.

Takaroa is about 15 miles long and 5 miles wide. There is an entrance into the lagoon, Te Avaroa, on the south-west side, admitting vessels up to 9 ft. draught, but it is narrow with a sharp angle. Anchorage is good everywhere in the lagoon,

and a coral jetty about 75 yd. long is situated near the village, on the northern side of the pass. There is also good temporary anchorage outside the pass, in 8–10 fathoms. In the extreme south-west of the lagoon a little enclosure in the reefs, about a mile in extent, offers shelter at all times for seaplanes. In 1933 there were about 400 inhabitants on the island. The village is attractive with white coral streets lined with palms and frangipani; the houses are neatly thatched. There are two Chinese stores of corrugated iron.

Takapoto is about 13 miles long. There is no pass into the lagoon, but landing may be made on the west side of the reef at two points. At the more northerly of these, in good weather, schooners can moor to the reef.

The island has about 80 inhabitants. Fresh water is conserved in tanks.

TIKEI

Tikei is a small, low wooded coral island, less than 1½ miles long by about 1 mile wide, lying about 38 miles south-east of Takaroa. It has a fringing reef, but is one of the few islands in the Tuamotu group which possess no lagoon, though the remnant of a dry lagoon can be traced. Its greatest elevation is about 10 ft.

The only landing is at the west point, but it is difficult.

The island is well wooded, but is said to have no supplies of fresh water. Some old trenches give evidence of former taro cultivation by methods of moisture conservation.

A small village stands on the west point of the island with a population of about 30 people, from Takaroa.

APATAKI

Apataki (formerly known as Hagemeister) is an atoll about 18 miles in extent, situated about 65 miles south-west of the King George islands. It was discovered by Hagemeister in 1830.

There are three passes into the lagoon, all on the western side. Pakaka or Schooner pass, the southernmost, admits only small vessels at the inner end, but offers an excellent anchorage for larger craft at the outer end, close to the village, and is easy of access. Avatika pass, the central one, can be used only by small craft, and with difficulty. Tehere pass on the north-west is practicable for large vessels, but is strewn with coral patches. There is anchorage at either side of the inner end of Tehere pass. Within the lagoon landing may be best made at a concrete pier, which was about 85 ft. long in 1933, and was then being extended. The village of Niutahi, which normally has about 150 inhabitants, is on the south side of Pakaka pass. Apataki for a time succeeded Fakarava as the headquarters of the Administrator of the group on account of the more favourable conditions for the culture and improvement of the pearl oyster, but has now been abandoned as such.

KAUKURA

Kaukura is an atoll about 25 miles in extent lying about 12 miles south-west of Apataki. Though devastated by the severe hurricane of 1878, the island has since been replanted and the northern side is well wooded. There is a pass into the lagoon, fit only for vessels of about 15 tons, on the north-east coast, and a boat entrance on the north-west side. The two villages of Motu Ura and Motu Panao are near these respective entrances. Stores and a good supply of fresh water are obtainable there.

ARUTUA

Arutua (formerly known as Rurik) is an atoll about 18 miles in extent, nearly circular, and lying about 9 miles west of the north end of Apataki. It is wooded on

the northern side, while large portions of the reef on the south side are quite submerged.

Perovaki pass on the east side gives small vessels access to the lagoon, but it is of indifferent quality. There is a boat passage on the north-west side.

The resident population comprises about 100 natives. But there is a considerable increase each year from Apataki and Kaukura during the copra and pearl shell fishing seasons. Arutua was discovered by Kotzebue in 1816.

Manihi and Ahe

These are two small atolls lying about 8 miles apart, at the north of the Tuamotu archipelago.

Manihi (Waterland) was probably discovered by Le Maire and Schouten in 1616. It is almost 14 miles long, and 6 miles wide. Pakua pass, at the south-west of the atoll, is deep and straight. Being narrow, however, and obstructed by reefs at the inner end, it gives access to small craft only. The lagoon is encumbered with coral shoals. The village, with a population of about 180 persons, is on the east side of Pakua pass, and has a wharf.

Manihi is one of the most productive islands for its size in the whole archipelago; coconuts flourish on the islets all around the lagoon, and the pearl shell resources are excellent. Copra production was affected for a time by the hurricane of 1878, which caused great destruction. About 80 tons per annum are now produced.

Ahe (Peacock), similar in type, and well wooded, is inhabited only at certain seasons by Manihi people. The village is on the south-west side.

Near the north-west point there is a pass available for vessels up to 100 tons, but its navigable width is small and it needs local knowledge. Anchorage can be obtained near the village and in the north-west angle of the lagoon.

Rangiroa

Rangiroa, the largest island of the archipelago, encloses a lagoon which is about 44 miles long with an extreme width of 14 miles. It lies about 63 miles west-south-west of Ahe. The atoll reef, which is narrow, is mostly tree-covered, with fine coconut plantations.

There are two passes into the lagoon. Avatoru, on the north-east side, is about 400 yd. wide, deep, and navigable by large vessels, though the tidal stream is violent. There is good anchorage to the east of the pass, except in northerly winds. Tiputa pass, on the north side, is narrower than Avatoru; it is navigable for large vessels, but dangerous to sailing craft (Plate 45). The anchorage here is not good in south-east winds.

There are two villages in Rangiroa—Avatoru and Tiputa. Formerly the atoll was an important pearl fishery, but intensive diving has largely exhausted supplies. A deterrent to diving also is that the lagoon is infested with sharks. Water is provided by a large concrete cistern erected by the administration.

The population of Rangiroa is about 700, and the production of copra is about 1,500 tons per annum.

Tikehau

Tikehau, 9 miles west-north-west of Rangiroa, is a circular atoll 10 miles in diameter, with a series of very productive islets on a barrier reef. It was discovered by Kotzebue in 1816.

Tuheiava pass, on the north-west side, gives entrance for vessels up to 60 tons. The anchorage is on the south side of the lagoon, about 8 miles from the pass, opposite the village. There are about 200 inhabitants on the island, mainly engaged in the cultivation of coconuts and taro.

MATAHIVA

Matahiva, a small circular atoll of about 5 miles in diameter, lies 22 miles west of Tikehau. It is the westernmost island of the Tuamotu archipelago, and was discovered by Bellingshausen in 1820.

The only pass is a boat entrance on the north-west side. The island is not permanently inhabited, but the people of Tikehau visit it periodically.

OTHER ISLANDS NORTH OF 20° S LAT.

REAO

Reao, the most easterly island of the Tuamotu group, was discovered by Duperrey in *La Coquille* in 1822, and named Clermont-Tonnerre. It is a narrow atoll about 10 miles long, and is wooded. The lagoon has no entrance. The best landing normally is near the village, at the north-west point, but when this is impossible the south side of the atoll is used. The inhabitants numbered about 350 in 1936, when the island was constituted the leprosarium for the group.

PUKARUA

Pukarua (formerly written, incorrectly, Pukaruha), is an atoll about $7\frac{1}{2}$ miles in length, north-west and south-east; it lies about 30 miles west of Reao. It was discovered in 1797 by Wilson in the *Duff*, and was originally named by him Serle's island. It is wooded on the north-western side, with a low barren flat on the south-west side. There is no entrance to the lagoon. The inhabitants numbered about 150 in 1936 (Plate 47).

TATAKOTO

Tatakoto, an atoll about 3 miles long and 1 mile broad, lies about 90 miles north-west of Pukarua. It was discovered in 1774 by Boenechea (who named it San Narcise). The land is low and the north-western part well wooded. There is no entrance to the lagoon. The island carried about 180 inhabitants, in a village in the north-west. There is very little fresh water. Copra production was estimated at about 400 tons per annum in 1936.

VAHITAHI

The next five islands, Vahitahi, Akiaki, Pinaki, Nukutavake and Vairaatea, may be grouped together since they formerly shared a homogeneous native culture, and all lie about the middle of the Gambier section of the Tuamotu archipelago. Pinaki and Nukutavake were discovered in 1767 by Wallis, who named the former Whitsunday island and the latter Queen Charlotte's island. A few days later he discovered Vairaatea, which he named Egmont island. Vahitahi and Akiaki were discovered by Bougainville, who named them Les Quatres Facardins and l'Ile des Lanciers respectively.

Vahitahi, about 90 miles south of Tatakoto, is a long atoll with no entrance to the lagoon, which is shallow and dotted with 'islets' of clam shell. The western part of the atoll rim is heavily wooded with large trees; the eastern part is bare, and the southern side is a low reef.

Landing is usually made on Mohitu islet on the west side, and there is another landing place on the north side. There is a broad sandy beach behind the reef and the ground is not greatly encumbered by coral.

The village is on the west side of the atoll, the houses being built of wood. Vahitahi is comparatively fertile, and some papaya, breadfruit and bananas are grown there, though they do not bear very well. Coconut palms are abundant, and copra is the principal product. There are several Chinese traders, who control the commercial field, and have many of the natives in their debt.

The Vahitahi people, while fairly wealthy by Tuamotu standards, and therefore well supplied with European goods, have retained much of their ancient culture beneath the veneer of civilization. They still perform certain of the old seasonal rites in connexion with the food supply, and they have a distinctive type of sea-going craft, an adaptation of a European model to native technique. These craft are shaped like a whaleboat, carry sail, and are steered by a tiller mounted on a pivot. But they are built by lashing hewn slabs of wood together with coconut fibre, and present a curious patchwork appearance. They vary between 20 and 30 ft. long, and the people go in them to Akiaki and Nukutavake to collect copra (Plate 48).

Akiaki

Akiaki, lying about 23 miles west-north-west of Vahitahi, is a small round coral island about three-quarters of a mile in diameter, with no lagoon. It is shaped somewhat like a button, and being rather higher than most of the other islands was formerly named Thrum Cap. Landing on the island is difficult.

Akiaki is comparatively fertile, and is well wooded. There is a village on the south-west side, but it is inhabited only seasonally, by people from Vahitahi who go there to prepare and load copra.

Pinaki

Pinaki, the southernmost of the group, is an atoll with three well-wooded islets on the north-western side. On the south side the reef is very little above water, and is bare of vegetation. There is a narrow entrance to the lagoon on the southern side, but it is impracticable even for boats.

The principal village is on the northern islet of the atoll. There is supposed to be buried treasure on Pinaki, but so far it has not been located.

Nukutavake

Nukutavake, about 8 miles north-west of Pinaki, is like Akiaki, of solid land. It is a coral island about 5 miles long, and has no lagoon. Except at the eastern end it is well wooded.

The village is on the north side of the island, and in 1936 the population was about 175 persons. But it is stated that during May, June and July most of the people move to Vairaatea, and in August to Pinaki.

Vairaatea

Vairaatea, about 24 miles west of Nukutavake, consists of two islands, Pukarunga to the eastward, and Pukararo to the westward, joined by a barrier reef surrounding a lagoon. Both islands are well wooded with coconut and pandanus trees. Landing is normally on the north point of Pukarunga, but is difficult on account of the heavy swell. There are only a few inhabitants.

AHUNUI, PARAOA, MANUHANGI

These are three atolls of small size spaced out roughly 30 miles apart and running in a north-west direction from lat. 19° 40′ S, long. 140° W. All are wooded, with no passage into their lagoons, and no inhabitants, though Paraoa is visited by people from Hao, who come to catch turtles and possibly to prepare copra. Ahunui (Byam Martin) was discovered by Beechey in 1826; at the same time he visited Paraoa (Gloucester). Manuhangi (Cumberland) was discovered by Wallis in 1767. It was denuded by the hurricane of 1906.

HEREHERETUE

Hereheretue (San Pablo) lies just north of 20° S, about 260 miles west of Ahunui, and about 88 miles west-north-west of Anuanuraro in the Duke of Gloucester group. It is thought to have been discovered by Quiros in 1606. An atoll about 4 miles in diameter, with no entrance to the lagoon, it offers difficulty in landing except on the north-west side, with the wind from the east-south-east. The village, containing only about 30 inhabitants, is near the western point.

NENGONENGO

Nengonengo, about 37 miles north-west of Manuhangi, is nearly circular in shape and about 6 miles in extent. It was discovered by Captain Wallis in 1767. On the eastern side a good passage leads into the lagoon, about 100 yd. wide and with a depth of 6 fathoms. The anchorage in the lagoon is good. The lagoon is reported to abound in pearl shell and black pearls are said to be found there. There are no permanent inhabitants, but it is worked as a private coconut plantation and labourers go there periodically.

HAO

Hao, an atoll 32 miles long, about 54 miles north-east of Nengonengo, was discovered by Bougainville in 1768, and named Ile la Harpe. It was visited by Cook in 1769 and named Bow island. There are many islets with vegetation on the windward side, but the reef is so low on the leeward side that the sea often passes over it into the lagoon (Fig. 60). On the north-west side Puratea bank extends south-west for about 5½ miles.

The only passage into the lagoon, known as Kaki pass, lies about the middle of the northern end of the atoll. It is practicable for vessels of 15 ft. draught, but it is sometimes dangerous for boats. There is an anchorage off the village, about 6 miles east-south-east of the entrance, but the lagoon is full of coral heads. At the village there are Chinese stores with limited supplies and fresh water in tanks. About 180 people live there, primarily engaged in diving for pearl shell. The island was visited by a hurricane in January 1903, and much of its vegetation was destroyed.

AMANU

Amanu, separated from the north-east end of Hao by a channel 9 miles wide, is an atoll about 18 miles in length. It was discovered by Andía y Varela in 1774. There are two small passes through the reef on the west side. The more southerly, Haahameru pass, is deep with an elbow and is the better for schooners. The more northerly, Manavatei pass, is short and straight but too narrow for convenience. There is also a boat passage farther to the north. Mediocre anchorage may be obtained in the lagoon in about 18 fathoms (Plate 46). The village of Ikitake is on the southern side of the principal entrance and has about 100 inhabitants.

Ravahere and Marokau

These are two atolls discovered by Captain Cook in 1773 and called by him the Two Groups. They lie about 65 miles west of Hao and are separated by a narrow channel, with room for a sailing vessel to work through with care. Ravahere is about 10 miles long, with no pass into the lagoon and no inhabitants. Landing is difficult. Marokau is about 10 miles long, with a passage into the lagoon at the south-east end for small craft in fine weather. Near the village, at the north-east point of the atoll, is a cutting through the reef, protected by a causeway of large stones, which gives a fairly protected landing place for boats during easterly or southerly winds. The village has about 120 inhabitants. It was destroyed in the hurricane of January 1903, but has been rebuilt.

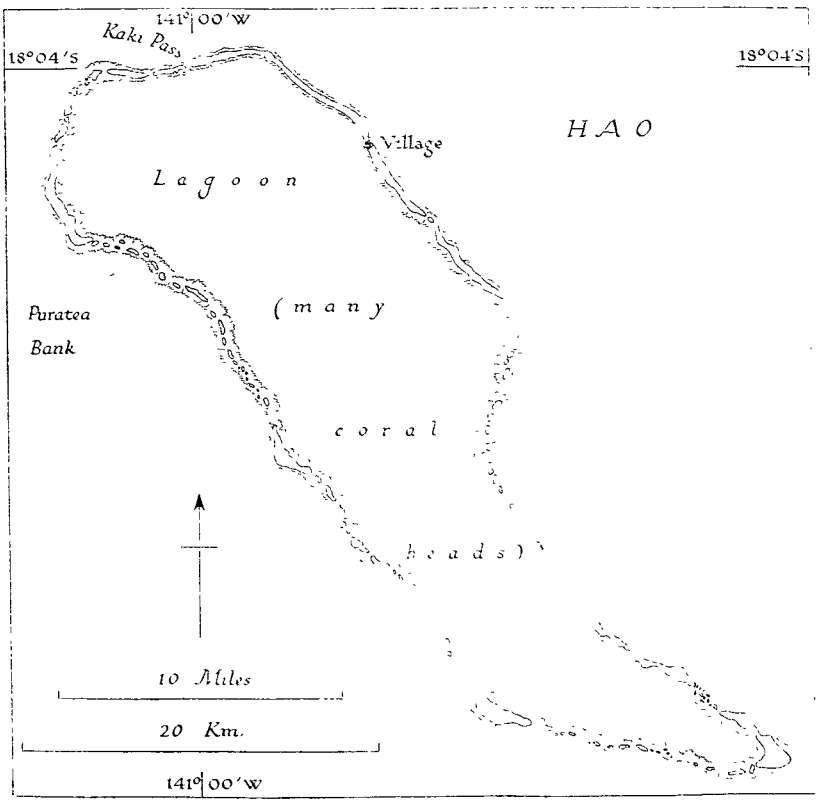


Fig. 60. Hao

Position of village approximate. Based on Admiralty chart no. 1111.

Tauere and Rekareka

These are two small atolls lying about 44 and 82 miles respectively north-west of Amanu. Tauere was discovered by Boenechea in 1772 but was named Resolution by Cook after his own ship in 1774. It has two islets, with several canoe passages

into the lagoon on the north-west side. There are only a few inhabitants. Rekareka (Good Hope) has apparently no entrance to the lagoon. A small village is situated westward of the south-west point, where the landing is. There is no fresh water on the islands.

Hikueru

Hikueru is an atoll situated about 65 miles west-south-west of Tauere; it is 7 miles long, and well wooded in the northern part. It was discovered by Beechey in 1826. The village of Tupapati is on the north-west side of the atoll, and the best landing place is about 200 yd. north-east of the wharf there. A light is shown from the western extreme of the atoll during the diving season.

The large lagoon is notable for its richness in pearl shell, and in the diving season the population is increased to upwards of 2,000 by natives from other islands. About 1,200 tons of pearl shell can be produced per annum. Water is provided by a large government cistern holding about 100 tons.

The great hurricane of 1903 did much damage at Hikueru. Several hundred people died, the village was destroyed, some schooners were lost, and the land area of the atoll was considerably reduced by islets being washed away.

Tekokoto, Reitoru and Haraiki

These are three small low atolls fairly near to Hikueru. Haraiki alone has an entrance into the lagoon, but only for small craft. All three are uninhabited. Much of the vegetation of Reitoru and Haraiki was destroyed in the hurricane of 1906.

Marutea and Nihiru

These are atolls about 29 and 47 miles north-east of Haraiki respectively.

Marutea (Furneaux), discovered by Cook in 1773, is 22 miles long. It is one of the most dangerous atolls in the archipelago, since the barrier reef is almost completely submerged. At the north-east end there is a small but difficult passage into the lagoon for small craft; the best landing is on the north-west side. There are a few huts there, but no permanent inhabitants.

Nihiru is a nearly circular atoll about 7 miles in diameter; it is well wooded except at the south and south-east points. There is no passage into the lagoon. The best landing place is in a large bay in the reef on the western side, where there is good fresh water in cisterns. There are about 80 inhabitants.

Pukapuka (Honuake)

Pukapuka (lat. 14° 50′ S, long. 138° 50′ W), the north-easternmost atoll of the archipelago, is not to be confused with Pukapuka, Danger island, in the Cook group. It was discovered by Le Maire and Schouten in 1616. There is no navigable passage into the lagoon. The island is wooded, with larger trees than usual, since the soil is deeper than on most of the islands. There are no permanent inhabitants, but Pukapuka is visited periodically by people from Fangahina.

Fangahina and Angatau

Fangahina (more correctly Fakahina and formerly known as Enterprise) lies about 100 miles south-west of Pukapuka; it was discovered by Kotzebue in 1824, and named Predpriatie. It is well wooded. There is no practicable passage into the lagoon, and the landing is on the south-west side of the atoll. The village, comprising about 150 inhabitants, stands on the south-west point.

There are many coconut palms (estimated at 48,000 in 1918) on the island, and in 1924 the export of copra was reckoned at approximately 800 tons per annum. For harvest purposes the palms of the island are divided into four sectors, and collection of nuts from them in turn is regulated by customary law. Coconut plantations have also been developed on Pukapuka by the people of Fangahina, on the initiative of their chief.

In the remote past the island appears to have been divided into three districts, usually at war. Later, two of these districts amalgamated, and the island had two high chiefs. Legends of famous voyagers still form part of the cherished lore of the people.

Angatau (more correctly Fangatau), about 38 miles west of Fangahina, was discovered by Bellingshausen in 1820, and named Arakchéev. There is no pass into the lagoon, but landing is made near the western point, where there is a jetty of coral rock, and a road leading to the village.

The soil of Angatau is loose and sandy, with less coral than on many of the other islands, and vegetation is correspondingly more abundant. Grass and ferns grow there, and the coconuts are known widely among the islands for their flavour. Papaya and banana grow, though they do not bear well. In former times taro was cultivated in trenches.

The village of Teana stands on the inner rim of the atoll, near the western point, with wooden and coral-rock houses roofed with corrugated iron. The population has been estimated at about 120. The island has a Chinese store, where bread is baked for sale.

Angatau is of note from the ruins of its ancient *marae*, the temple of Papaterangi, once the most famous sacred place in the Tuamotu group. A few of the great stone back-rests still stand on the site.

The Disappointment Islands (Napuka and Tepoto)

These two islands were discovered and named by Byron in 1765, when he was unable to land there because of rough weather and the apparent hostility of the natives. They are the most northerly of the Tuamotu group, lying just below 14° S, west of long. 141°, and are about 12 miles apart. Being relatively isolated, more than 100 miles from the nearest land, and lying in a quarter to which passage from Tahiti is not favoured by the prevailing winds, they have had rather less foreign contact than many of the other islands of the archipelago.

Napuka is the official name of the more easterly of the two islands, but it is known to the natives as Te Puka, or in full as Te Puka a Maruia, from the large *Pisonia* trees there associated with Maruia, a chieftainess who traditionally ruled the two islands in ancient times. Alternatively, the two islands are known as Pukarua, the two lands of the *Pisonia* trees, Napuka being distinguished as Te Pukarunga, 'above' or to the east, and Tepoto as Te Pukararo, 'below' or to the west, that is, down wind.

Napuka is an atoll of irregular shape, about 4½ miles long by 2 miles wide. The average width of the land rim is about a quarter of a mile. The lagoon is studded with many islets built up by the people, who deposit clam shells there on shoals after the flesh has been taken for food.

There is no pass into the lagoon, but landing is usually made just north of the west point of the atoll, where there is an entrance too shallow even for canoes, which the natives carry overland between the lagoon and the sea. A small depression in the reef allows canoes to be run up and drawn ashore, but landing from schooners is made in surf boats on the reef.

Fresh water on the island is obtained from the village well; it is shallow, but has a sandy bottom and the water is of good quality. There is also a private well on land belonging to the chief, while several other disused wells exist; these have apparently been abandoned because the water had been fouled by crabs. The water is used mainly for bathing and washing clothes; young coconuts are relied upon mainly for drinking purposes.

The soil of the island is largely decomposed coral and sand, with little vegetable matter, and agriculture consists largely of care of coconut plantations. On the windward side of the island the soil is most fertile, and papaya and squash melons, recently introduced, have been planted there. Apart from the plants mentioned, pandanus, *Morinda citrifolia*, *Pisonia* and species of *Cordia* and *Portulaca* are found in the vegetation.

The population of Napuka was estimated in 1934, for purposes of communal distribution of food, at 192, excluding infants in arms. The health of the people is comparatively good, though they are subject to occasional epidemic disease introduced by vessels that call. The village, at the west end of the atoll, extends from the sea to the lagoon, and occupies part of an islet section (*motu*) of the reef. It has two main streets intersecting at right angles, and two other streets branching off diagonally from them. These streets are about eight to ten paces wide, curbed with coral rock, and are kept well swept. The houses are commonly of a type transitional between Tuamotu and European style. They are rectangular, built of panels of plaited coconut leaves lashed or nailed to a framework of poles, with pandanus or coconut-leaf thatch. Some of the houses rest on the ground; others are raised on a platform of coral rock with a floor of coral pebbles.

Tepoto differs from Napuka in being an old atoll in which the lagoon has dried up, possibly owing to emergence of the land, leaving only a shallow depression in which there is a waterhole. The island is nearly circular in shape, with a diameter of about 1 mile. It is flat, with an elevation of little more than 15 ft. The strand is of white sand and broken coral, while the surface of the island is littered with much broken coral and occasional blocks of coral deposited by the sea in the hurricane of 1906.

Landing is made on the west side of the island. There is no anchorage round it, though there is a precarious mooring for schooners with an anchor to the reef, stern on.

The population of Tepoto in 1934 was estimated at 45, exclusive of infants in arms. The people live in a village on the west side, near the landing. The general culture of the people of Tepoto is similar to that at Napuka, and communication between the two islands by canoe is fairly frequent. In case of emergency the people communicate by smoke signals.

The soil of the island is fertile, and about one-third of the surface has been estimated to be under rather poor cultivation. There are two brackish wells, but the people rely primarily on coconuts for drinking purposes.

Culture. Owing to the relative lack of contact with the outside world, the social organization of the people has preserved much of its former structure.

The household is the ordinary social and economic unit with members not necessarily of the immediate biological family. Children are usually brought up by their grandparents and adoption of children is common. Social organization in larger groups was formerly based on a clan system, but the four clans which existed have now merged their interests into those of the community as a whole.

Communal ties play a very important part in economic life. Land ownership is on a family basis, but some types of food, as turtle and fish caught in large quantity, are regarded as communal property, and are distributed equally throughout the group as a whole. The plantations of papaya and squash melon are communal, and the produce, harvested weekly, is equally distributed. For the handling of copra there is a co-operative society, a recent development; the proceeds are divided according to the amount of land formerly held by each of the four clans.

Chieftainship, an institution now absorbed into the French system of local government, is still regarded by the people with something of the old veneration. For instance, it is believed that when the principal chief of Napuka is setting out for Tepoto in his canoe, the sky all round the horizon darkens, and the people there know that the chief is on his way to them.

The ancient religious system was broken down some 60 years ago by Roman Catholic missionaries, and the people are now staunch Christians. Sunday is observed as a day without work, and the missionaries are largely responsible for the

European type of clothing worn by the women, for the increasing use of Tahitian instead of the local Tuamotu dialect, and for the introduction of reading and writing, a knowledge of which is fairly general.

The language of Napuka presents certain peculiarities, in having three sets of words for many common objects and actions. One of these is the Tahitian word; another is a general Polynesian form common to many groups; and the third is a 'root speech', apparently of a local archaic type. Thus for 'water' the Tahitian word *pape* is understood, as also the general Polynesian form *vai*, but the term in common use is *komo*, not found elsewhere in Polynesia. 'To eat' is *amu*, as in Tahitian, or *kai* as in most Polynesian dialects, but a term *noe* is said by old people to be an alternative.

The economic life of the people is comprised mainly in simple agriculture and in fishing, the latter being the principal source of food. The sale of copra provides nearly all the small cash income, and at certain seasons most of the people move over to the windward side of the island to prepare the copra. Occasionally pigs and fowls are sold to visiting schooners; when pearl diving is profitable some of the young men go to other islands to engage in the industry. No pearl oysters are fished in the lagoon locally. Possibly from lack of economic opportunity some people have moved to Fangahina in recent years.

There are no wheeled vehicles on the islands, and all transportation is by canoe or by hand, usually with a carrying pole.

Takume

Takume lies about 105 miles south-south-westward of the Disappointment islands, its western point being in lat. 15° 53′ S, long. 142° 17′ W. With its close neighbour Raroia it was discovered by Bellingshausen in 1820.

It is an atoll about 14 miles long, and heavily wooded for the most part. There is no pass for vessels into the lagoon, but near the western point there is an entrance by which boats may have access. This is dry at low water, however, and landing then must be made on the reef. At the north of the atoll there is another small entrance used by the native canoes.

Near the western point stands the main village; another village is at the north of the atoll. These are inhabited alternatively as the collection of copra dictates. Fresh water is obtainable on the island from government cisterns of about 20 tons capacity. Takume is noted for its fishing and its pearl shell.

Raroia

Raroia (formerly named Barclay de Tolly) lies a few miles south-west of Takume. A strong current runs in the channel between them, with a heavy sea with winds between north-east and south-east.

The island is an atoll about 21 miles long, fairly well wooded on the northern and western sides. Ngarue pass, the entrance to the lagoon, is on the west side; it is divided into three channels, of which only the most northerly is safe for vessels, and then only for those drawing not more than 13 ft. Anchorage is available in the lagoon in 15 fathoms, and an L-shaped jetty in front of the village gives good shelter to a few small craft.

The village of Ngarumaova lies about 1½ miles south-west of the pass; it has about 100 inhabitants. There is little fresh water on the island.

Taenga

Taenga (Holt) is situated west-south-west of Raroia, at a distance usually given as 29 miles, though it is reported as being charted too far to the westward.

It is an atoll about 11 miles long, well wooded on the northern side, but with the southern side for the most part consisting of reef awash. There are two passes into

the lagoon. One, on the north-east side, is small; the other, on the south-west side, is about 40 yd. wide, and admits vessels of about 200 tons. The village on the southern side has about 100 inhabitants.

Makemo

Makemo, about 40 miles in length, was discovered by Turnbull in the *Margaret* in 1803. It lies about 18 miles south-west of Taenga. The northern side is well wooded, but the southern is bare and dangerous of approach. There is a population of about 200 in two villages, Puheva on the north-east and Vahinatika on the west side. Near each is a pass into the lagoon, Puheva pass being clear, deep and 300 yd. wide, suitable for any vessel; and Tapuhiria pass being suitable for vessels up to 26 ft. draught. There is good anchorage in the lagoon, in 7–12 fathoms. Puheva village, with a boat wharf and streets laid out, is the seat of government of the district. Fresh water in moderate quantities is available from cisterns there.

Raevski Group

The Raevski group consists of three small atolls, Hiti, Tuanaka and Tepoto, lying near together roughly 18 miles south-west of Makemo. They are uninhabited. Hiti (Eliza) has no entrance into the lagoon; Tuanaka (Reid) and Tepoto (Ofiti) have each a small boat entrance into the lagoon on the north side. (In French usage Tuanaka is known as Tuanake.)

Katiu

Katiu, about 15 miles long, lies about 16 miles west of the west end of Makemo. It was discovered in 1822. It is low, and mostly covered with vegetation. There are two passes into the lagoon, one on the south-west being for boats only; the other, Toini pass on the north-east, being suitable for schooners, which can moor to a wharf in front of the village of Toini. This has about 80 inhabitants.

Motu Tunga

Motu Tunga (Adventure), roughly 25 miles south-west of Makemo, is a very low atoll about 8 miles long, discovered by Cook in 1773. It is inhabited for only part of the year. There is a boat passage near the north point, and a pass for small vessels on the north-west side, leading to an anchorage opposite the village of Marokupenga. (In the French *Instructions Nautiques* the name of the island is given as Motununga.)

Tahanea

Tahanea, about 10 miles north-west of Motu Tunga, is an atoll about 25 miles long. It was discovered by Bellingshausen in 1820.

Three passes lead into the lagoon on the north-east side. Otahu pass, to the east, is fit only for small craft; Manino pass, in the middle, is practicable for large vessels, and leads to an anchorage; Motu Puapua pass, to the west, is dangerous.

The island is wooded along the northern part, and the people of Katiu and Faaite have coconut plantations there, which they visit at times. There are no permanent inhabitants.

Faaite

Faaite, about 7 miles from Tahanea, to the north-west, is an atoll about 16 miles long, and lightly wooded. It was discovered by Bellingshausen in 1819. There is a

passage into the lagoon at the north-west end, for small vessels up to 60 tons. The best landing place in the lagoon is on the north, where the main village stands. Good water exists here, but is not easy to procure.

ANAA

Anaa, formerly named Chain island, situated about 44 miles south-west of Tahanea, is an atoll about 19 miles long, with eleven islets. It was discovered by Cook in 1769. There is no entrance to the lagoon, but approach is easy on the lee side. The best landing is on the north-east, at a small pier, from which a road leads to the village of Tuuhora, about half a mile from the beach. Anaa formerly contained a large population, estimated at 1,500 in 1874, but this has decreased greatly as the result of hurricanes in 1879 and 1906. There are now about 700 people. It is still the best cultivated island of the Tuamotu archipelago, with the largest export trade.

Anaa was in ancient times one of the principal islands of the archipelago, and the centre from which many war expeditions went out.

TAIARO

Taiaro (formerly named King) is a small atoll lying to the north of Katiu. It is nearly circular, about 3 miles in diameter, and is thickly wooded with coconut palms and pandanus.

There is no pass into the lagoon; the best landing is on the south-west side.

Taiaro is visited by natives of Kauehi, about 28 miles to the west; it is recently reported to be inhabited by a family of white people.

RARAKA

Raraka, about 25 miles north-west of Taiaro, is a nearly circular atoll about 14 miles across; it was discovered by Ireland in 1831. There is an entrance into the lagoon, navigable for small vessels of about 100 tons, on the north-west side. The small village of Matahai is situated near the pass.

KAUEHI

Kauehi (Vincennes) is an atoll nearly circular in shape and about 12 miles across; it was discovered by Captain FitzRoy in H.M.S. *Beagle* in 1835. It lies about 10 miles north-west of Raraka. There is a pass into the lagoon, on the south-west side, about 100 yd. wide and 5 fathoms deep, and there is anchorage in the lagoon. A village with about 200 inhabitants is situated about 9 miles north-east of the pass.

ISLANDS SOUTH OF 20° S LAT.

Of the fifteen atolls south of 20° S lat. and west of Mangareva only one, Tematangi, had a fixed population in historic times. Its people were descended from folk who had drifted there from Hao. Tureia, Vanavana and the four islands of the Actaeon group were occupied from time to time by natives from the Vahitahi area, and most of the others were occasionally inhabited, but the origin of the people is not definitely known.

SOUTH MARUTEA

South Marutea, situated about lat. 21° 30′ S, long. 135° 30′ W, may have been discovered by Quiros in 1606; it was definitely seen by Captain Edwards in 1791, and was named Lord Hood's island. It is an atoll 11 miles long and about 4½ miles

wide, and consists of a cluster of small shrub-covered islets on a barrier reef almost awash or only a few feet high. There is no entrance into the lagoon.

There is no permanent population, but the village, inhabited only during the copra or pearl diving season, is at Averetini islet, on the north of the lagoon. Labourers and pearl divers for the atoll are recruited from Mangareva as well as from the Tuamotu islands, and the Mangareva people of to-day claim that the island formerly belonged to them, and was visited by their ancestors.

Though many of the fish in the lagoon and around the island are poisonous, all oysters, lobsters and giant clams are edible.

Maria

Maria (Moerenhout island), an atoll lying about 40 miles south-west of Marutea, and about 95 miles north of the Mangareva group, was discovered by Moerenhout in 1829 (though its discovery is sometimes attributed to Ebrill in the *Amphitrite* in 1832). It has a circumference of 8 or 9 miles.

There is no passage into the lagoon. The island is partially wooded with pandanus and bushes, but it has no coconut palms. There are no permanent inhabitants, though it is visited occasionally by pearl divers.

The Actaeon group

This group, beginning about 40 miles east of Marutea, consists of four atolls, named from east to west Matureivavao, Tenarunga, Vahanga and Tenararo. This group is quite probably Lás Cuarto Coronadas (the Four Crowns) discovered and named by Quiros in 1606, though their discovery is generally attributed to Thomas Ebrill in the Tahitian merchant ship *Amphitrite* in 1833. They were first made known to geographers by Captain Lord Edward Russell, H.M.S. *Actaeon*, in 1837. The atolls are low and well wooded, with no passes into their lagoons. The group was probably settled by castaways from Vahitahi about 1840, though it is now uninhabited. On Matureivavao, the largest atoll, about 6 miles long, fishermen have tried at various times to establish themselves, but have always been driven out by bad weather. Vahanga has been planted in coconuts since 1922, and recently has been owned by a French company.

Morane

Morane (Cadmus island) is a low coral atoll 5 miles long by $2\frac{1}{2}$ miles wide, without an entrance to the lagoon, in which are situated three low islets. The island, which is about 115 miles west of Mangareva, was seen by Moerenhout in 1832. The highest part of it is covered in pandanus, and in 1922 there were four coconut palms. The island is uninhabited, and there is no fresh water.

Mururoa

Mururoa lies about 137 miles west-south-west of Matureivavao in the Actaeon group. It was discovered by Carteret in 1767; he gave it the name of Bishop of Osnaburgh's island.

The atoll, which is 17 miles long and 8 miles wide, is the only one in the south-eastern Tuamotu group with ship's passage into the lagoon. There are two passes, that to the north-east being the wider, but that to the south-west being the shorter and clearer. Both have a depth of 12 ft. Anchorage may be obtained in the lagoon, where there are general depths of 20 fathoms, but there are many dangerous coral patches, and the holding ground is not good.

The atoll rim has about eighteen islets, mostly on the eastern side, and wooded. The north-west side is very low and almost awash.

Large plantations of coconuts have been made by a company to which the island was assigned in 1876, and pearl diving has been carried on there. There is a village, with a few inhabitants, on the eastern point.

FANGATAUFA

Fangataufa, 24 miles south-south-east of Mururoa, was discovered by Beechey in 1826. He named it Cockburn. The island is about 5 miles long by 3 miles wide, and has no inhabitants or coconut palms. It is nearly oblong in shape, with the southern side much curved. The lagoon is deep, and the barrier reef low and narrow, with no entrance.

TUREIA

Tureia (or Papakena), a very low wooded atoll about 5 miles in diameter, lies about 60 miles north-north-east of Mururoa. It was discovered by Captain Edwards in 1791. There is no pass into the lagoon, and landing needs care. From about 1860 the island has been inhabited by a few families from Vahitahi, joined in 1891 or 1892 by people from Tematangi. The population in 1934 was about 60 people. There is a village with a stone church on the north point of the island.

VANAVANA

Vanavana, also known as Kurateke or Barrow, lying about 32 miles west of Tureia, was discovered by Beechey in 1826. It is about $1\frac{3}{4}$ miles in extent, and is only a narrow strip of land surrounding a lagoon, into which there is no passage. It is thickly wooded, and under some of the trees large pits have been reported, containing fresh water. There are no regular inhabitants.

TEMATANGI

Tematangi was discovered by Captain Bligh in 1792 and named by him Lagoon island. It is a low atoll about 7 miles from east to west. There is no pass into the lagoon, but with easterly winds landing is fairly easy on the south-west, to the west side of a natural causeway connecting two islets, and also on the north side of the reef.

In 1856 the American schooner *Sarah Anne* was wrecked there, and the seventeen people on board were killed and eaten. The native inhabitants were converted to Catholicism about 1884, and in 1891 or 1892 they were persuaded by the mission to leave the island and settle on Tureia. Since then Tematangi has not been inhabited except when open for pearl diving. In 1934 the island was made government property, and the natives lost their ownership.

THE DUKE OF GLOUCESTER GROUP

This group consists of three small atolls averaging about 2 miles in diameter, without a boat passage into their lagoons. Landing in each is made on the north-west side and is easy only in easterly winds.

Nukutipipi, the easternmost atoll, lies about 222 miles west of Vanavana; it is well wooded on the northern side. It was discovered by Carteret in 1767, and, together with Anuanurunga, named the Duke of Gloucester islands. There is a village with about 30 inhabitants near the north point of the atoll.

Anuanurunga, about 13 miles west-north-west of Nukutipipi, has four islands on its encircling reef. It is often stated that it was discovered by Quiros in 1606, and named the Four Crowns, but it is possible that he applied this name to the Actaeon

group, to the south-east, and that the atoll was first discovered by Carteret. It is uninhabited, but planted in coconut palms.

Anuanuraro, a small atoll lying about 14 miles west-north-west of Anuanurunga, is often identified as the Archangel island of Quiros, from the opinion of Lieut.-Commandant Ringgold of the United States Exploring Expedition in 1841, though it was very far out of position. Its discovery may, however, be credited to this expedition, by which its true position was first determined. The atoll is oblong in shape, lying north-west and south-east, and is wooded on its eastern side. On the north-western side there is a small boat passage, and off it a vessel may anchor in easterly winds. It was inhabited in 1937.

BIBLIOGRAPHICAL NOTE

No adequate general account of the Tuamotu archipelago has yet been published, though much material has been accumulated by the research expeditions of the Bernice P. Bishop Museum at Honolulu. Apart from the descriptions given in the works of reference cited in the Bibliographical Note to Chapter III, the following sources are most useful:

C. Gessler, *Dangerous Islands* (London, 1937; also published in the United States under the title of *The Road My Body Goes*—the translation of an expression from a native song of travel). This gives a very good picture of life on the atolls, with a detailed account, drawn from the work of K. P. Emory as well as that of the author, of Napuka (Te Puka) and Tepoto, two of the more isolated islands.

G. Friederici, 'Ein Beitrag zur Kenntnis der Tuamotu-Inseln', *Mitteilungen des Vereins für Erdkunde zu Leipzig für das Jahr* 1910, pp. 97–176 (Leipzig, 1911). The first part of the article gives a useful geographical account of many of the atolls; the second part, which is ethnological and linguistic, is of less value.

K. P. Emory, 'Tuamotuan Stone Structures', *Bernice P. Bishop Museum Bulletin*, no. 118 (Honolulu, 1934). This includes much historical and other detail apart from archaeology.

A.-C. Eugène Caillot, *Histoire des Religions de L'Archipel Paumotu* (Paris, 1933), also gives some account of the culture of the people.

K. Elschner, *Corallogene Phosphat-Inseln Austral-Oceaniens und Ihre Produkte*, pp. 70–4 (Lübeck, 1913) and G. P. Wilder, 'The Flora of Makatea', *Bernice P. Bishop Museum Bulletin*, no. 120 (Honolulu, 1934), give information about Makatea, while Père H. Audran, 'Traditions and Notes on the Paumotu (or Tuamotu Islands)', *Journal of the Polynesian Society*, vols. XXVII–XXVIII, *passim* (New Plymouth, 1918–19), describes the culture of the people of Fakahina and Angatau.

For maps see Appendix I.

Chapter VI

THE MANGAREVA GROUP, THE AUSTRAL ISLANDS AND RAPA

The Mangareva Group: Temoe: *The Austral islands and Rapa*—Maria; Rimatara; Rurutu; Tubuai; Raivavae; Rapa; Marotiri: Bibliographical Note

The Mangareva group, the Austral islands and Rapa are in strong contrast to the Tuamotu archipelago. They are in the main comparatively high, rugged islands, primarily of volcanic formation. In consequence they have a more abundant water supply and vegetation, and agriculture plays a larger part in the life of their inhabitants. But each group has its own individual character.

THE MANGAREVA GROUP

The islands of the Mangareva group (formerly known as the Gambier archipelago) lie approximately between lat. 23° 00′ and 23° 15′ S, long. 134° 50′ and 135° 00′ W, about 900 miles south-east of Tahiti. They consist of four inhabited high islands, Mangareva, Taravai, Akamaru and Aukena, together with several smaller islands used for cultivation or residence when fishing (Fig. 61).

Physical Geography

All the islands are small and comparatively narrow. The largest, Mangareva itself, is about 4 miles in length and about 1 mile in maximum width, at its south-west end. It contains the highest point in the group, Mt Duff, 1,447 ft. high (Plate 52). Taravai is about $2\frac{3}{4}$ miles long, Akamaru $1\frac{1}{2}$ miles long, and Aukena 2 miles long. The last is composed of two arid peaks joined by a tongue of land. Makaroa, another island about 1 mile long, is particularly steep and rugged; it rises to 479 ft. high, and from a distance resembles a ship.

Structure

The main islands and a number of rocky islets lying in the lagoon to the west have been formed from residual parts of the rims of extinct craters. Each main island has a characteristic structure: a

long axis of a high razor-backed ridge, rising into peaks, with secondary ridges running down from it to the coast to end in steep promontories. In between these promontories are bays with some flat land, formed from the eroded soil of the ridges. Most of the cultiva-

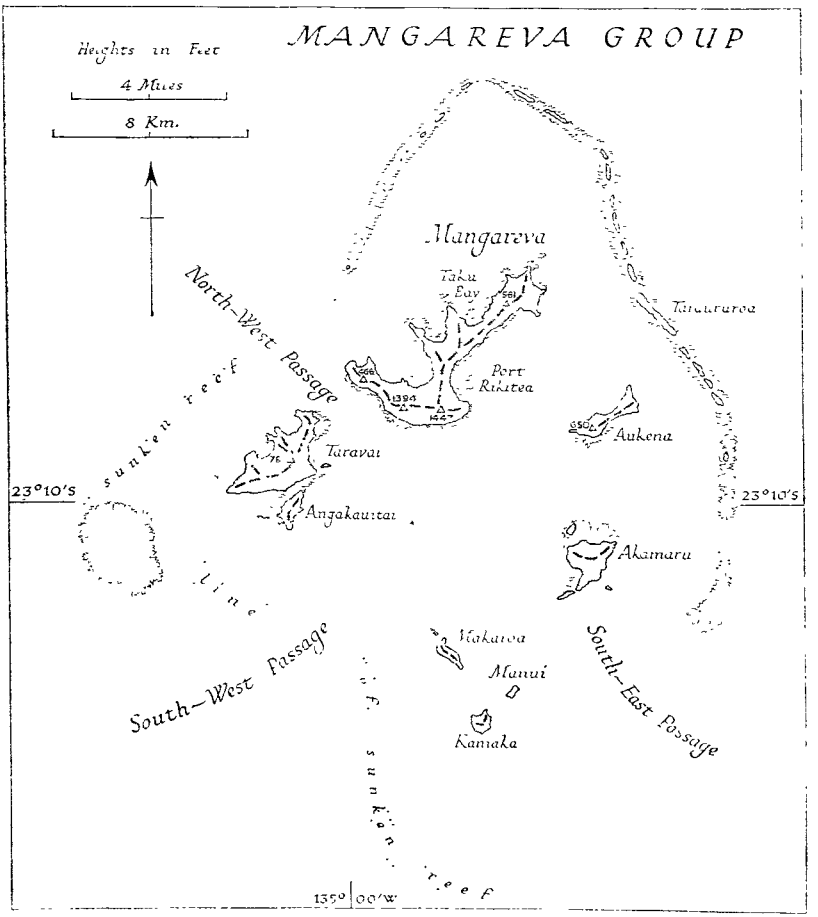


Fig. 61. Mangareva group

For general key to symbols see p. 8. Based on Admiralty chart no. 1112.

tion exists on these flat lands and in the short valleys running back from them. The high land is mostly denuded of fertile soil and is bare of vegetation except for a luxuriant growth of cane grass, which in the dry season is often swept by fires. Stone of vesicular basalt is common, and provided the early inhabitants with material for tools.

Coast

A marked feature of the group is the semicircular outer barrier reef of coral. Never more than 100 yd. wide, it stretches round from the north to the south-east, and, standing several miles out from the main islands, effectively protects them from the force of the ocean. This reef is dotted with coral islets, which are covered in pandanus and coconut palms. To the west and south-west the reef continues to

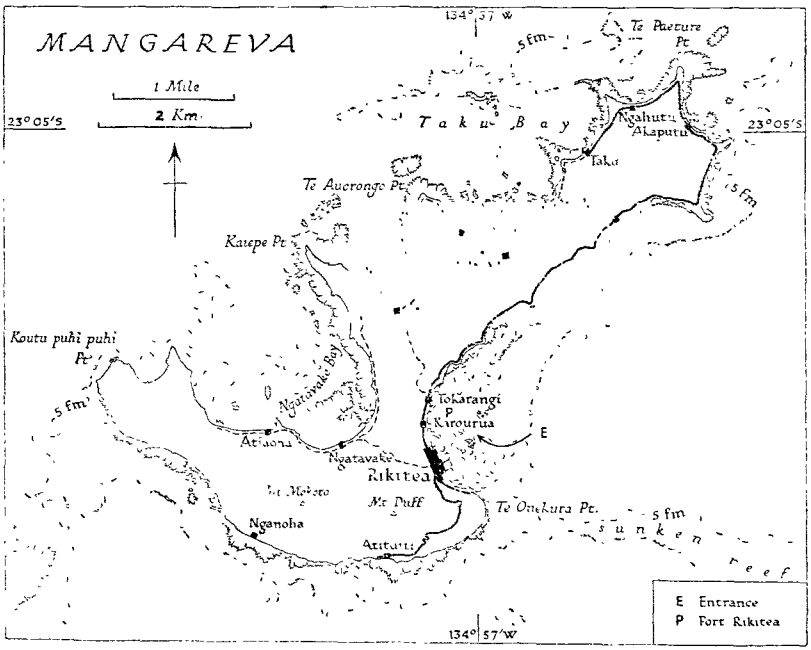


Fig. 62. Mangareva island

The rectangular enclosure on the shore by Rikitea is a modern but neglected stone-walled fish pond. Based on: (1) Admiralty chart no. 3673; (2) Te Rangi Hiroa (P. H. Buck), *Bernice P. Bishop Museum Bulletin*, no. 157, pp. 6–7 (Honolulu, 1938); (3) K. P. Emory, *Bernice P. Bishop Museum Bulletin*, no. 163, pp. 17, 20–1 (Honolulu, 1939).

complete the circuit, but in a submerged form. The outer side of the reef springs from a great depth; the inner side descends with a slope to the lagoon floor at irregular depths of from 3 to 25 fathoms. In addition to the barrier reef, each island is surrounded by a fringing reef, submerged, and broken by narrow channels which allow canoes to reach the shore.

The beaches are of grey sand besprinkled in places with black, formed from broken-down lava.

Passes and Anchorages. There are three passages through the barrier reef into the outer lagoon, on the north-west, south-west and south-east. That on the north-west is limited by two bars, one on the barrier reef, the other between Taravai and Mangareva; the inner, more shallow one has a least depth of $3\frac{1}{2}$ fathoms. The pass on the south-west has depths of about 4 fathoms; and that on the south-east about $5\frac{1}{2}$ fathoms.

Anchorage is available to vessels of not more than 12 ft. draught in Taku bay (Fig. 62), which is sheltered, but demands local knowledge. This is the only anchorage where a moderately large vessel can lie near the shore. A wharf near Taku village can accommodate craft not more than 200 ft. long. Another anchorage, with shelter from the south-east, is under the lee of Taravai. There is also an outer anchorage off Rikitea, in the roadstead between the reefs extending from the east coast of Mangareva and the shoals on the inner side of the barrier reef. To reach this anchorage the channel passes over the bank between Mangareva and Aukena, with least depths of only about 12 ft.; the anchorage is inconveniently deep and of only limited extent.

Port. Port Rikitea is a basin about 300 yd. in extent, lying between a complex series of coral banks which provide good shelter from seas, though the anchorage is exposed to the south-east trade winds. The channel entering the port from the roadstead is intricate, and can be used only by vessels drawing not more than about 12 ft. The holding ground is good. Landing can be made at several small jetties, and fresh water can be obtained from a tap at one of them.

Rikitea is the only port open to commerce in the Mangareva group; it was formerly a port of entry, but permission to enter must now be obtained from Papeete. Its importance is small, since it simply serves the needs of the small Mangarevan community.

Climate

The prevailing winds in the Mangareva group are the easterly trades, which blow with increasing strength from March to August, and decrease between September and December. In August strong winds occasionally reaching gale force, accompanied by rain, occur from a westerly direction.

The hottest period of the year is approximately from December to March. From one year's observations in 1903, in June and July the

mean daily maxima and minima were 78 and 67° F., 79 and 65° F. respectively. Temperatures then rose fairly steadily to a mean daily maximum of 86° F. in January and 87° F. in February, with a mean daily mimimum of 73° F. in those two months. The extreme temperatures recorded were a maximum of 91° F. in February and March and a mimimum of 57° F. in June.

The dry and the rainy seasons are not well marked, and there appear to be no months without some rain; the greatest fall, however, in 1903, when there was a total precipitation of 107 in., took place from September to December. This period contributed about half the annual rainfall.

Mean pressures range from 1013 mb. in March and April to 1018 mb. in August.

Water Supply. There are no permanent streams on the islands, though a few springs exist, and seepages are utilized by the natives for growing taro. Rain water is collected in cisterns for drinking purposes, and Rikitea, the main village, has piped a permanent spring supply.

Vegetation and Fauna

Mangareva offers a strong contrast to the rich vegetation of other volcanic islands in Polynesia. The flora is scanty, the steep slopes of the hills and the rocky soil not being conducive to growth. Native tradition holds that trees as well as cultivable food plants were introduced by the first Polynesian settler; it is estimated that of the plants useful to man only seven species are indigenous, and about twenty-two species must have been introduced by the Polynesians. The vegetation includes coconut, breadfruit, banana, taro and sweet potato, grown especially in the alluvial soil of the bays; pandanus, hibiscus, arrowroot, sugar cane, candlenut, Malay rose-apple (*Eugenia malaccensis*), bamboo, banyan and a species of *Erythrina*, all these being found especially on the lower slopes. The paper mulberry still grows on Taravai, but the turmeric, formerly cultivated for its dye, appears now to have died out. A cane (*Miscanthus japonicus*) grows extensively over the higher slopes of the hills on all the islands.

The group has no native mammals. The rat was present before European contact, but was introduced by the Polynesians, while their own domestic pig became extinct. The ordinary European domestic animals are now there in small numbers. Birds comprise mainly several species of tern, a booby, a tropic bird, the common heron of the islands, and a few waders.

The People

History

The earliest settlers of Mangareva apparently were drift voyagers in small numbers from the Tuamotu islands, but perhaps in the fourteenth century organized settlement from higher islands to the north-west seems to have taken place. Rarotonga is mentioned in ancient traditions as the place of origin of some of these colonists, but since the culture of the people of Mangareva shows strong affinities with that of the inhabitants of the Marquesas, this group may well have been a colonizing source.

Though Davis in 1687 may have sighted Temoe and Mangareva, the true credit of discovery and description belongs to Captain James Wilson of the *Duff* in 1797. In 1827 and subsequent years several vessels visited the group to obtain pearl shell, and in 1834 the conversion of the people to Christianity began with the arrival of two French Catholic missionaries. In the ensuing century, under mission tutelage and control, the people have lost much of the old culture, though they still retain much of their former economic life, and their Polynesian language.

Population

According to the census of 1931, the population of the Mangareva group, exclusive of that of the Tuamotu islands in the Gambier administration, was 501 persons, of whom 52 were non-natives. Most of the people live on Mangareva, the main island; Akamaru and Taravai have about 70 and 50 inhabitants respectively. But the population is now so intermixed with people from the neighbouring atolls of the Tuamotu group and even from the Austral islands that full-blooded Mangarevans are found in only a few families.

The population has decreased considerably since the early years of European contact. In 1842 it was estimated at 1,500; the huge church at Rikitea, begun in 1839, was built to seat 1,200 people, but is little used now. In recent years, however, a very slight trend towards an increase of population seems to be perceptible. In 1935 there was an excess of deaths over births, amounting to 4; in 1936, 1937 and 1938 births exceeded deaths by 8, 12, and 15 respectively.

There are nearly twenty villages in the group, but the principal settlement is Rikitea, on a bay on the eastern side of Mangareva island. Its bungalows are set along a wide shaded road running parallel to the harbour; from the sea they are hidden to the roof-tops

by luxuriant vegetation. The settlement is dominated by the huge church, or cathedral, built of white coral rock, with two high towers. An unusual and striking appearance has been given to its interior by the use of pearl shell as the main decorative medium.

Ancient Culture

In pre-European times the people of Mangareva were organized on a basis of district groups, which for a considerable period were ranged in two confederations, Rikitea and Taku, between which warfare was common. Fugitives from battle used the islets in the lagoon and on the outer reef as temporary refuges. Cannibalism was practised, from a definite desire to increase resources in flesh food, as well as from revenge or ritual motives. A system of rank divided the community into commoners, a middle class and a hereditary aristocracy, the last-named furnishing the chiefs of the districts. When a chief became powerful enough to rule over the separate islands or over a district confederation he became a 'king', with great religious sanctity and autocratic powers. The land was owned by the aristocracy and leased out to the middle classes and to commoners to farm.

In housing, clothing and general culture, Mangareva had much in common with Tahiti and other Polynesian communities already described. But at the time of the first European contact canoes had been displaced by rafts. This is almost unique in Polynesia. Previously, large double canoes had been used, but the last of these had been destroyed in war about the beginning of the nineteenth century. At the present time rafts in their turn have disappeared completely, and for fishing and travel within the lagoon the people use outrigger canoes built after an introduced Tahitian model.

Before their acceptance of Christianity the people had a polytheistic religion in which the major god was Tu, well-known elsewhere as a member of the Polynesian pantheon. But whereas in New Zealand, Hawaii and central Polynesia Tu was pre-eminently the god of war, in Mangareva he was the god of breadfruit. An annual first-fruits ritual lasting several days was performed to induce him to give a bountiful crop of this staple food. As elsewhere in central and eastern Polynesia, stone temples were important religious structures; they consisted of paved courts with raised platforms at one end. They are now not common on Mangareva, since many were broken up to provide building material for the cathedral; they are better preserved on Temoe. An interesting feature of Mangarevan religion is the

wood carving, particularly the small effigies of the gods, which were hewn out in a realistic style of the human form. A few of these effigies still survive in museums. Priests acted as intermediaries between these gods and the people, and there were also seers or spirit mediums who became possessed by the gods, to prophesy or reveal hidden matters.

Language

The people of Mangareva speak a Polynesian dialect which resembles those of the Maori of New Zealand and of the people of the Cook islands and of the Tuamotu archipelago, in using the *k* and *ng* consonantal sounds. The dialect further resembles that of the Cook islands in using the glottal closure (a break in the voice) instead of aspirating an *h* sound. The European methods of representing these sounds have caused some difficulty. The French priests, who reduced the language to writing, used the letter *g* for the *ng* sound, as in the Tuamotu and elsewhere. They also wrote *h* for the glottal closure where they heard it, but they evidently failed to hear it in some words, for they often omitted it. *Aa*, 'mouth', for instance, is the accepted spelling of the word which should properly be written *aha* in the French transcription, or *a'a* in a modern phonetic transcription. (In the maps and text of this chapter *ng* is used, in conformity with the general practice throughout this book, and with the French spelling of the name Mangareva itself. The glottal closure, however, which presents greater difficulty in equating with usage in other Polynesian groups, is rendered by *h* according to the conventional French practice.)

Administration and Social Services

The area known by the French as the Gambier administration comprises not only the Mangareva islands proper, but also a number of atolls of the south-eastern Tuamotu group, with a total population of about 1,500. The Mangareva group proper is divided into four districts, and the lagoon into four areas, open in rotation for pearl fishing. Administration is under the control of a French gendarme, living at Rikitea.

Social services in the group are few, but there are several mixed schools of primary standard. In recent years the frequent visits of medical officers have improved the health of the people, and this has been manifested by the change in the demographic position already noted.

Economics

Commercial activity in the group is small, though three trading firms from Tahiti have depots on Mangareva. Occasionally the islanders travel as far as Tahiti in their schooners, carrying agricultural produce and the special mats made in the group.

The main occupations of the people are agriculture and fishing. The staple food, even after so long a period of European contact, is still fermented breadfruit, and its preparation is an important pursuit. Taro, sweet potatoes, and bananas are cultivated. Little taro was grown in ancient times. Much of the present development of this type of cultivation is due to Rapa natives—from whom the Mangareva people adopted at least one variety of taro—and to Tuamotu natives, especially those of Reao. The coconut and the fruit of the pandanus are also used as food. The introduction of manioc, which grows on land unsuitable to breadfruit, has materially improved the lot of the poorer people. European fruits are also grown with success, though in small quantity. The climate would probably allow of the cultivation of cotton and coffee, but neither has been developed. Domestic animals, except for pigs and fowls, are scarce; there are some saddle horses and a few goats.

Fish is an essential item of food, and its importance is shown by the native saying, 'The garden of the poor is the sea'. At Rikitea, near the residence of the former king, there is a large rectangular fishpond, now neglected. In the shallow inner lagoons pearl oysters are abundant; in former times, and still to some extent, their flesh was used as food. Diving for pearl shell provides the people with a cash income. The value of the pearl shell fisheries was estimated about 1914 at between £10,000 and £15,000 per annum, but a more recent estimate puts them at only about £800 to £1000 per annum.

Communications

Communication with Tahiti was formerly maintained twice yearly by the French inter-island service, but this has been interrupted at various times, and dependence is mainly upon irregular trips by auxiliary schooners.

Inland, on Mangareva island, the villages are linked by horse tracks, which are comparatively good, though lack of labour prevents them from being maintained to the best standard. On sloping or swampy ground these tracks are often paved with large flat-topped

basalt stones, or occasionally blocks of coral, fitted together. This work is probably ancient.

About 1932 a W/T station was erected at Rikitea, with primary communication with Tahiti. There is no telephone or other telegraph service.

TEMOE

Temoe, lying about 25 miles south-east of the Mangareva group, was probably sighted by Davis in 1687, but was named Crescent island by Captain Wilson in 1797; it is incorrectly spelt Timoe on most charts.

The island is a low coral atoll about $3\frac{1}{2}$ miles long and $1\frac{1}{2}$ miles in greatest width. The lagoon is completely enclosed by a reef about 100 yd. wide and in general less than 3 ft. above water, though there are several wooded islets upon it.

Landing is difficult, since there is a heavy surf, but it is not impossible, as is sometimes stated.

The atoll was occupied at various times by people from Mangareva, but in 1838 the population moved back finally to the parent group. Recently their descendants planted the islets in coconuts, and have since visited it periodically to prepare copra.

THE AUSTRAL ISLANDS AND RAPA

The Austral islands proper (known to the French administration as Iles Tubuaï) lie south of the Society islands, and consist of five scattered islands; often included with them are the two more isolated islands of Rapa and Marotiri to the south-east. As a whole they lie between 21° 45′ and 28° S lat., and 143° 30′ and 155° W long. All are French possessions. The total land area is said to be about 67 sq. miles, of which Rapa occupies perhaps 16 sq. miles, but some authorities give a total area of nearly double that figure (Fig. 63).

Geologically, the Austral islands appear to be a south-east extension of the Cook group, and to represent all that remains above water of a vast submerged mountain chain. All the islands, with the exception of Maria (Hull), which is a typical atoll, are volcanic in origin, and nearly all, especially Rapa, are rugged and mountainous. There is little low ground on any of the larger islands, except a narrow strip along the coast. The soil is fertile, and the water supply adequate, though not abundant.

The climate is warm, and the seasons well marked. The islands lie at about the southern limit of the south-east trades, which blow from November to March among the northern islands. In the cold season, from May to September, winds are more variable and often westerly, with much rain, especially at Rapa. Hurricanes are apt to occur in the hot season, especially from January to March, but the frequency is probably less than one in three years.

The total native population of the whole group in 1911 was about 2,500; in 1936 the total population was about 3,500. Maria and Marotiri (Bass Rocks) are uninhabited. The people are practically all Polynesians, and by a regulation of 1938 no persons other than natives may land on Rurutu or Rimatara without special permission.

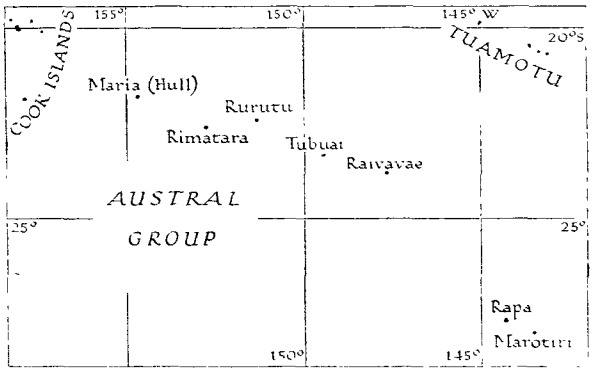


Fig. 63. Austral islands including Rapa

Based on Admiralty chart no. 783.

The natives of Raivavae and Tubuai are French citizens; those of the other islands are subjects of France. The Austral islands were attached to the Gambier administration in 1903, but the administrative centre is now Moerai on Rurutu, where there is a French *agent spécial*. There are also gendarmes on Tubuai and Rapa. Social services are almost lacking. There are no special medical facilities. A few primary schools exist.

Economic resources are almost wholly agricultural, and coffee, copra and cattle are the main exports. Vanilla was formerly important, but its production has declined greatly owing to reduced prices. Beds of manganese ore in Rurutu have not been exploited.

Communication is primarily with Tahiti, but is infrequent. The French inter-island service, instituted in 1914, formerly paid regular visits though on no definite schedule, but this has now ceased after

several interruptions. Irregular visits of trading schooners, some locally based, afford the main facilities.

There are only two good harbours in the group, Raiurua in Raivavae and Ahurei bay in Rapa; apart from these there are several anchorages with partial shelter.

There is no telephone service in the group, and no telegraph apart from a W/T station on Rurutu.

MARIA

Maria (Hull or Sands islands), lying approximately in lat. 21° 48′ S, long. 154° 41′ W, is the westernmost of the Austral islands. It consists of a group of four small islands on a reef of triangular shape, forming an atoll of about 3 sq. miles in area. The highest of the islands has an elevation of about 65 ft., and all are wooded with pandanus and coconut palms. The reef is usually stated to have no opening, though a passage for rowboats has been reported. Landing is difficult on account of the surf. The lagoon is shallow.

The atoll was first reported by the whaler *Benjamin Tucker* in 1845. The islands were leased in 1902 to Lever's Pacific Plantations, Ltd., for the cultivation of coconuts, but apparently the lease has now been abandoned. There are no inhabitants, though natives from Rimatara occasionally go there for fish and for the young of sea birds, and with those of Rurutu share in the exploitation of the copra to be made there.

RIMATARA

Rimatara, lying about 340 miles south-west of Tahiti, is a small almost circular island, about 3 miles across.

Physical Geography

The island is primarily of volcanic formation, and rises to a height of 315 ft. in the centre, at a hill known as Oromana. From the central slopes small streams flow into a series of swamps, whence the water gradually finds outlet under an ancient elevated reef which occupies a great part of the outer fringe of the land. This raised reef, in the form of a hard white limestone, has been considerably eroded in places, but in general extends inland for several hundred yards and presents a cliff 20–30 ft. high towards the sea.

The island is also surrounded by a recent coral reef which fringes the shore in most places but which forms a small enclosed lagoon

near the village of Motuura, where an islet about 500 yd. long extends seaward from the mainland. The lagoon has a curving beach of white sand backed by casuarina trees. The reef is pierced by three small openings, two on the northern and one on the east side, used as boat passages in fine weather. Through the easterly opening to the north, the best of these, natives say that schooners of 50 tons have been launched.

Anchorage may be obtained in fine weather from 300 to 400 yd. from the reef. Landing is not easy, but may be made on the reef-fringed beach of Anapoto, and elsewhere on the north and west.

Social and Economic Conditions

The population, stated to have been 272 in 1931, is now in the region of 400. The people live in three villages, Amaru, Anapoto and Motuura. For administrative purposes the island is attached to Rurutu.

For its size, Rimatara has a comparatively large area of flat cultivable land. The soil is fertile, and vegetation is luxuriant. Taro is grown extensively, and oranges, bananas and breadfruit are plentiful. Pigs are reared, but fish is scarce. Small amounts of coconut oil, copra and cotton are exported. There are a few Chinese traders.

The villages are connected by a road which is practicable for horse vehicles, of which there are a few on the island. The interior of the island is easily accessible on horseback or on foot.

RURUTU

Rurutu (lat. 22° 25′ S, long. 151° 20′ W) is situated about 80 miles east-north-east of Rimatara. It was discovered by Captain Cook in 1769. The island is between 6 and 7 miles long and about 3 miles in greatest breadth, with a total superficial area of about 8,500 acres.

Physical Geography (Figs. 64, 65)

Geologically, Rurutu resembles in some of its features the high islands of the Cook group. In parts it is very rugged, and rises to about 1,300 ft. at the highest point, Mt Manureva.

The main watershed is a broad, nearly flat-topped ridge, which curves to the south of Manureva till it reaches the coast at Evepia point, on the west: to the north-west of Manureva is a plateau attaining an altitude of about 800 ft. From this higher ground a large number of small streams flow down in deep steep-sided valleys. The

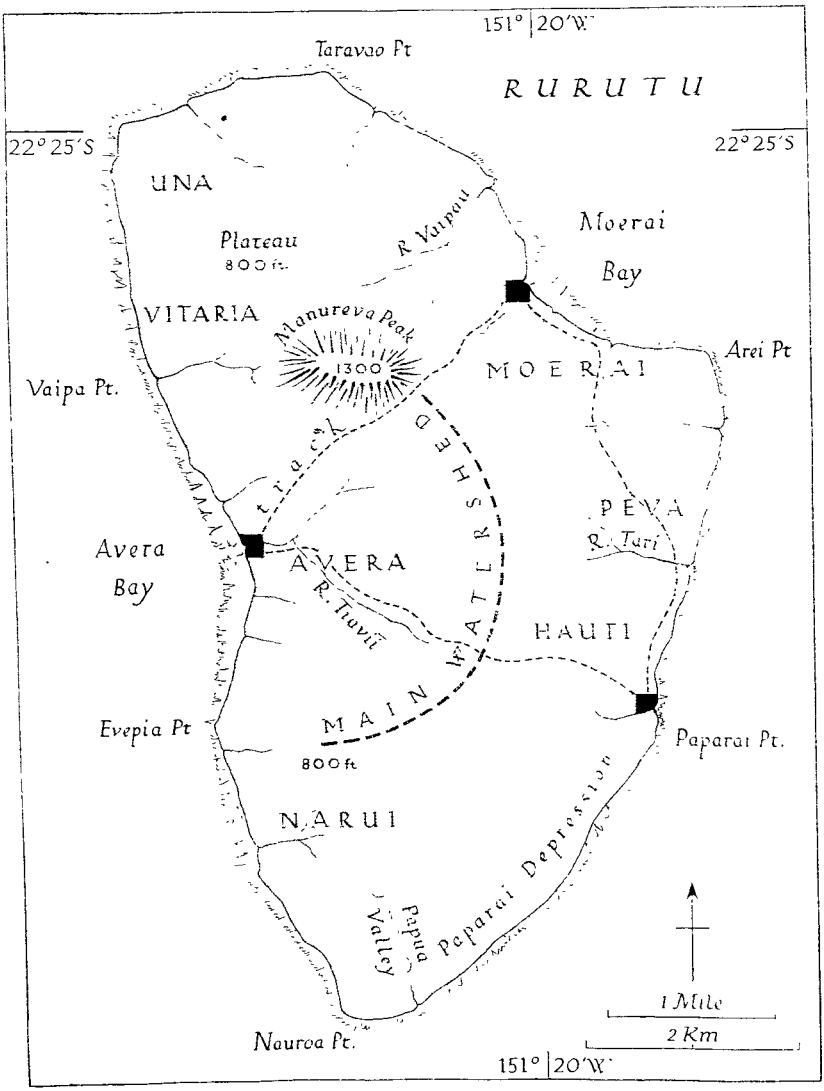


Fig. 64. Rurutu

The trend of the main watershed is generalized. Cliffs (extending round much of the coast) are not shown. Based on: (1) L. J. Chubb, 'Geology of the Austral or Tubuai islands (South Pacific)', *Quarterly Journal of the Geological Society*, vol. LXXXIII, p. 304 (London, 1927); (2) official sources.

coastline is fairly even and unbroken by any considerable bays. On the north-east, north-west and west coasts there are plains of recent formation, about 1½ miles long, raised about 6 or 8 ft. above sea level and composed of coral debris and sand. Elsewhere in most places limestone cliffs of a hard crystalline structure, the remains of an ancient coral reef of the *makatea* type (p. 542), rise abruptly from the sea to a height of 200 or 300 ft. On the north-west of the island, particularly, a cliff of this material is continuous for a mile or more along the coast, and the formation extends inland for a considerable distance. Isolated patches of limestone also crop out at altitudes up to 500 ft. Near this limestone occur small deposits of manganese which, though rich, are probably of no commercial importance. Through the centre of the island runs a belt of rocks containing large deposits of iron pyrites which have yielded traces of both gold and platinum. Metamorphic slaty rocks have been reported from the Tiavii valley. The highest parts of the island are made up of recent volcanic rocks containing much pumicious material.

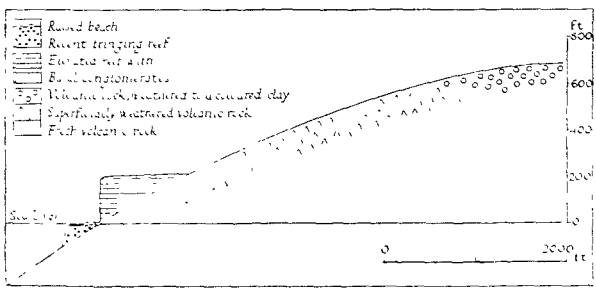


Fig. 65. Rurutu: generalized section

Based on L. J. Chubb, 'Geology of the Austral or Tubuai islands (South Pacific)', *Quarterly Journal of the Geological Society*, vol. LXXXIII, p. 308 (London, 1927).

The island is surrounded by a fringing coral reef which as a whole is very close to the shore. The best anchorage is in Avera bay, in the middle of the western side in 10–15 fathoms; it is safe during the prevailing easterly winds. Moerai bay on the north-east coast is not safe when the trade wind is blowing strongly. There are several boat passages through the reef for landing on the north-east, west and south-east sides (Plate 53).

Social and Economic Conditions

The population of Rurutu in 1931 was 1,202, including 5 Europeans and 26 Chinese. There are three villages: Moerai on the north-east,

the principal settlement and residence of the French special agent; Avera on the west; and Hauti on the east. All the villages are very well kept, and most of the houses are built of stone cemented with lime, with wide verandahs and galvanized iron roofs.

The people embraced Christianity as early as 1822, and the native pastors are in effect the chiefs of the island. The inhabitants of each village form a kind of co-operative association, with a president as nominal head, but with the real authority in the hands of the pastor.

The natives of Rurutu are among the most industrious and independent in the Eastern Pacific. They build and operate their own schooners on co-operative lines and not only carry their own produce to Tahiti but also call at Rimatara and Tubuai and sometimes go as far afield as Rapa.

The general aspect of the island is wooded. The valleys carry a variety of common plants and trees; the *makatea* is overgrown with hibiscus, casuarina and ferns; and the upper slopes of the hills are covered with a kind of fern, interspersed with casuarina. But the vegetation has suffered much from burning, and only two areas of endemic forest remain. Moreover, the soil is not particularly fertile, and the usual tropical fruits are not so plentiful as on Rimatara or Tubuai. The chief vegetable product is taro, which all Austral islanders prefer to breadfruit. Vanilla was formerly grown to a considerable extent, but owing to a severe drop in its price in the 'depression' years the export has diminished. The chief exports are now arrowroot, copra, pigs, cattle, and native hats and mats made by the women from pandanus leaf.

Communications

Communication with Tahiti as well as with the other islands of the Austral group is maintained by the trading schooners, which run at irregular intervals, but on the average perhaps once a month.

The villages are connected by paths leading over the hills, and most of the island can be traversed on horseback. Bicycles are used in the villages.

There is a W/T station at Moerai, but the island has no other signal communications.

TUBUAI

Tubuai lies about 325 miles south of Tahiti, in lat. 23° 23′ s, long. 149° 27′ w. The more correct form of the name is *Tupuai*, said to

have been derived from a tract of land on the island, known as Tupuaiehitu.

Physical Geography

The island is roughly oval in shape, with the long axis running approximately north-east and south-west; it is about 5 miles long by 3 miles wide. From a distance to the north or south it appears as two separate islands, but closer approach shows the low land between the high points.

Structure (Fig. 66)

Tubuai is of volcanic origin. All the rock except that of coral formation is igneous in character, but there are no lava flows or other evidence of recent volcanic action. About half the island is mountainous, with fairly easy slopes up to scattered peaks. The point of greatest elevation is Mt Taitaa, 1,309 ft. high, near the centre of the island; Mt Mareiara, 1,024 ft. high, is a prominent peak near the west coast. (This latter peak is marked on the Admiralty chart as Mt Tonarutu, which in its more correct form of Tunarutu should apparently apply to a lower peak to the north.) A considerable portion of the island is swampy, the two largest swamp areas, known as Motavahi and Mihiura, being on the north-west and south-west sides respectively. Each of these swamps has at least one stream draining into it from the mountainous area to the east.

The island is entirely surrounded by a barrier reef, the outer part of which lies from 1 to 3 miles off shore. The reef is usually awash, except for seven islets, four of which are well wooded with coconut palms, casuarina trees and undergrowth, the other three being sandbanks with little vegetation.

Passes and Anchorages

There are several passages through the reef, but only that on the north-west side, opposite Mataura, gives entrance for a vessel of more than 40 tons. It is called Anamoana.

Anchorages are poor. Off the entrance to the pass there is an anchorage in bad holding ground, about 600–800 yd. from the reef; it is most unsafe with winds from the north. Mataura anchorage, within the pass to the eastward, is available for vessels up to 12 ft. draught, but there are rocks and the holding ground is bad. It is uncomfortable owing to a westerly current and a swell from seaward. There is a small jetty, but it does not project beyond the reef.

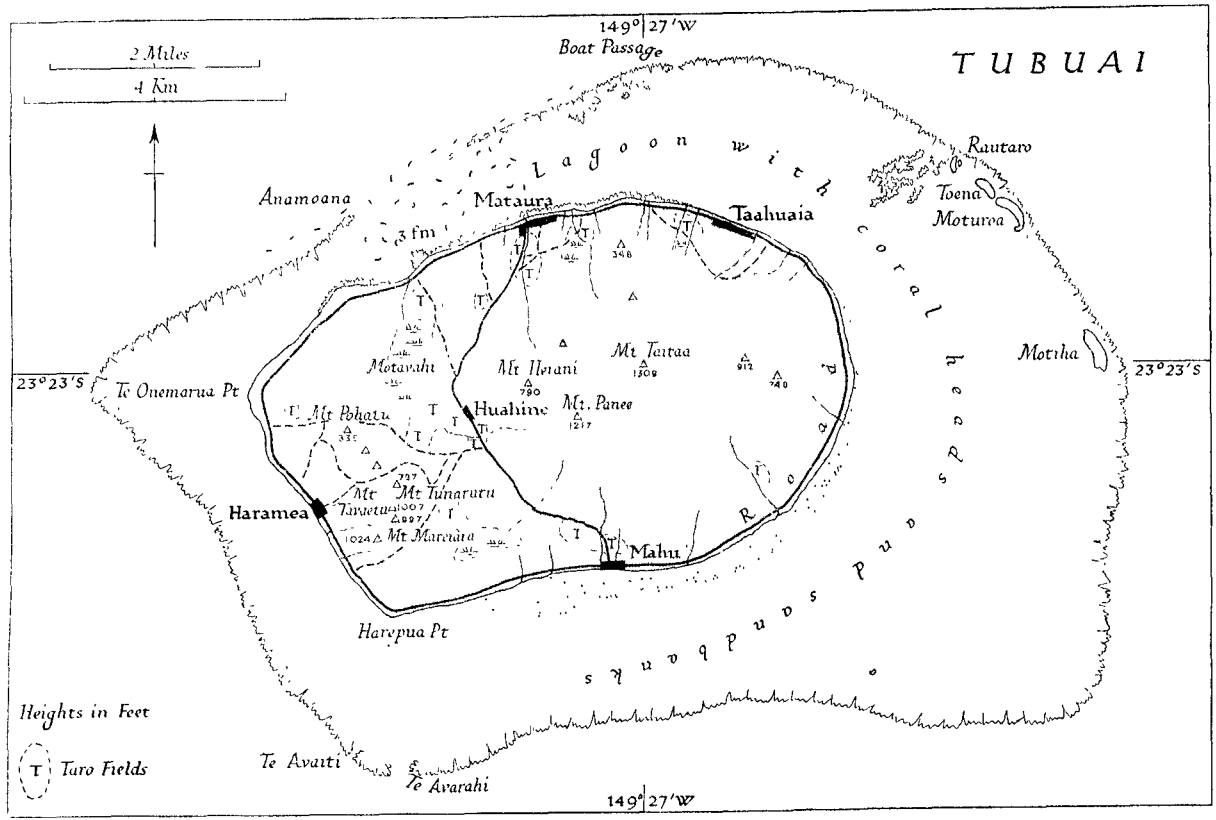


Fig. 66. Tubuai

Based on: (1) Admiralty chart no. 2868; (2) French Admiralty chart no. 4962; (3) R. T. Aitken, *Bernice P. Bishop Museum Bulletin*, no. 70, plate 1 (Honolulu, 1930).

Water Supply

Water is in plentiful supply for agriculture but for domestic purposes is fairly scanty. There are a few springs and some shallow wells, but water from the latter is usually brackish. Drinking water is carried from the numerous streams, from places where there is supposed to be no contamination, but many houses having galvanized iron roofs use barrels as storage for rain water. The liquid of green coconuts is also used for drinking purposes.

Vegetation and Fauna

The island is fertile, and well wooded in the lower regions, with most of the species common to the Eastern Pacific. Around the shores are plants such as the goat's-foot convolvulus, and trees such as pandanus, casuarina and coconut palm. Inland, types such as banyan, hibiscus, bamboo, breadfruit, tamarind, Tahitian chestnut, paper mulberry, guava, *Morinda citrifolia*, *Thespesia populnea*, *Cordyline* and gardenia occur; banana, taro, yam, arrowroot, manioc, gourd and papaya are cultivated. The higher lands are for the most part sparsely timbered, and clothed with grass. In all the range of flora, comprising about 150 kinds, there are few plants that are not put to some use by the people.

The land fauna of Tubuai consists mainly of birds, of which eleven species have been recorded. They include terns, two kinds of tropic bird, a frigate bird, a heron and several kinds of petrels. The marine fauna includes many types of fish; it is said in Tahiti that nowhere are fish so plentiful or of as great a variety as at Tubuai. With one or two exceptions all kinds are edible.

History and People

Tubuai was discovered by Captain Cook in 1777. Mutineers from the *Bounty* attempted to settle there in 1787, but after a fight with the natives they returned to Tahiti. In 1822 Protestant missionaries were supplied from Tahiti at the request of the people, who speedily adopted Christianity.

The population of the island is primarily Polynesian, but not of pure local descent, there being now many immigrants from the other Austral islands, Mangareva, and even from the Tuamotu, Society and Cook islands. In 1936 the total population was 937, comprising 920 Oceanic French citizens (Polynesians), 2 metropolitan French citizens, and 15 foreigners, mainly Chinese.

During the last century the population has increased considerably. An estimate in 1824, after the island had been ravaged by an epidemic, set the number of people at 300, and this has been judged to be probably correct within 10 %. In 1887, the first official census gave the population as 397. By 1917 it was 543, and in 1922 the official figure was 755—which suggests large immigration, as does the considerable rise since then.

In physical type the people show the traits common to all Polynesians: light brown skin, dark wavy hair, regular features with rather thick lips and fleshy nose, and the suggestion of a Mongolian fold in the eye. Measurement of their physical characters has not been easy. Some years ago objection was made by them to the collection of hair samples for study, through their fear that the hair might be used in magic rites to cause sickness or death to the person from whom it was taken.

The language spoken in Tubuai at the present time differs in only a few minor particulars from that of Tahiti. It is distinguished from that of Rurutu, which is also a form of Tahitian, by the very distinct pronunciation of *h* and *f*, whereas in Rurutu the *h* is barely sounded and is generally used instead of *f*.

Culture

The modern Tubuai dwellings are mostly of simple style, built of milled timber, or of stones set in a mortar of lime and sand, and plastered. Galvanized iron is commonly used for roofing, but at times of high prices, as after the last war, a reversion to native materials sets in, and pandanus leaves, coconut leaves or marsh grass are used. The pandanus especially is favoured because the leaf is said to be more durable as roofing even than iron, and is much cooler. Many of the houses have window frames and doors of milled timber, but hinged shutters of wood often replace glass windows.

In social organization the people of Tubuai follow a general Polynesian form, with the individual family as the kernel of the structure, but with larger groups of kinsfolk playing an important part in land holding and other affairs. Membership of such a group is ordinarily transmitted in the male line. The genealogies by which membership in a group can be traced are important, as the French courts in Tahiti recognize the ability to state family connexions for a number of generations as proof of title to land. The joint ownership of much land by members of a kinship group complicates the purchase of land by persons not of the community; the only safe way to acquire a title

is to buy from the French government land that has been forfeited for failure to pay taxes.

In social and economic affairs women play an important part. Many women own property, and a family house or the land upon which a family depends for its taro is as likely to belong to the mother as the father. In mass meetings the women as well as the men are called upon for their opinions. In working the taro gardens, in making copra and the starch from manioc, and in the preparation of food both men and women take part, though actual cooking is usually done by the women. Heavier work such as felling timber, building houses, clearing fields of the tangled wild growth, building canoes, and sea fishing, is done by the men; the women plait hats, mats and baskets, gather the marsh grass used as floor covering, and care for the house and the children. Despite their long subjection to Christian influences, not more than about half the Tubuai couples are married. No stigma attaches to those who live together without marriage, and their unions seem to be as stable as those of people who have been united by the church.

The present population of Tubuai is distributed primarily in five villages, of which Mataura is the principal one. This village pattern of life is presumably due to the influence of the missionaries, which caused the people to gather about the places where the teachers established their headquarters and their churches. Formerly, the settlements were less clearly defined, and each family seems to have had its own house site on the lands it farmed.

In former times the island community was divided into districts, each with a chief, and warfare between them was common. At times the political ascendancy was gained by a single chief, who thus became 'king'. The last of these 'kings' was reigning when the French took possession of the island. At times part of the population was conquered or absorbed by invasion from other islands, particularly Raivavae. The influence of Raivavae upon Tubuai culture was great in pre-European days. Since the advent of Christianity a standardization of both language and culture upon a Tahitian model has occurred.

Administration

Tubuai was claimed as having been included in the French protectorate of Tahiti in 1842, but it has been an effective part of the French sphere only since 1880.

Administration is largely in the hands of a resident French

gendarme at Mataura, though theoretically some power is vested in the local native governor and the council of men who elect him from their own ranks. Taxes are collected either in cash or in labour, the latter being sufficient to keep roads and bridges in condition, and to care for the school-house and other government buildings. As already noted, land may be forfeited by failure to pay taxes.

Economics

Agriculture and fishing are the principal occupations of the people.

Agriculture

Taro, the main vegetable foodstuff, is grown on irrigated low lands or in swampy areas; in most of the valleys terraced fields indicate abandoned cultivations, and it is estimated that hardly 10 % of the available taro land is now utilized. Sixteen varieties of taro are recognized by the Tubuai people. Bananas are grown on small patches of well-watered and drained land; they are used for food, and a considerable quantity is exported in dried form to Tahiti and to the Tuamotu islands. More than a dozen varieties are recognized, most of them imported in the last sixty years or so. The most generally grown is a Hawaiian type of banana; the 'mountain plantain' which is such an important food in the Society islands is not common in Tubuai. Yams and sweet potatoes are also grown but are less important food items than formerly; being easily stored they were valuable for sailing trips. Manioc is a principal source of cash income for many of the people, besides furnishing an important local food. It is grown on sloping ground, not too dry, but well drained, and matures in from one to three years according to the variety and the nature of the soil. The starch, extracted from the grated roots, finds a ready market in Papeete, and the residue provides food for pigs and poultry. Vanilla, an important cash crop in some other islands, needs too much care at the time of its fertilization to appeal to the Tubuai people; there are only a few acres of it in cultivation. The Chinese traders export a small quantity.

Citrus fruits, maize, tobacco, gourds, capsicum, pineapples, sugar cane and various vegetables are grown in small quantity, and some coffee is cultivated on the hill slopes. Potatoes have been tried, but unsuccessfully, and rice, planted without care in a few places, has likewise not succeeded. The coconut palm is cultivated, but given little attention after a few years. Copra is an important item of export.

The main copra makers are Chinese, and they take most of the native coconut crop in exchange for goods. These Chinese traders operate small stores, either independently or as agents for firms in Tahiti.

Cattle and pigs are reared, as also are turkeys, but they are all kept mainly for export to Tahiti, being held to be too valuable for local consumption.

Fishing

A great variety of fish is obtained in the lagoon, mainly by spearing on the part of the younger men, and by hand-line fishing from canoes on the part of the older men. The spearing is done under water by swimmers wearing home-made goggles. A certain amount of fish is also obtained by communal sweeps with a long rope made by tying coconut fronds together to form a fringe. These sweeping ropes may be half a mile or more long, and require about 100 people to operate. The catch from such a sweep is divided equally among the participants. Though the results from the economic point of view do not compare well with those from individual fishing, the occasion is a festive one and is appreciated for its sociability.

Craftwork

The Tubuai natives are excellent canoe-men and fair sailors, but poor navigators. The modern Tubuai canoe closely resembles that of Tahiti, being a single-outrigger type, with hull built on a dug-out foundation. Nearly all canoes more than about 16 ft. long are fitted for sail, though no long journeys are now undertaken in them. Most of the canoes carry only one or two men, though a few of the larger ones will hold a crew of six to eight.

A subsidiary industry in the island is the making of sennit cordage from coconut fibre, with the aid of wooden or iron cranks; this cordage is of good quality. Mats, hats and baskets are plaited from a cultivated variety of pandanus by women. The industry, though traditional on the island, is not so well developed as on Rurutu, and the best mat makers on Tubuai are women who originally came from Rurutu or who were taught by them. Bamboo strips are also used for making women's hats, and coconut leaf for domestic baskets.

COMMUNICATIONS

Communication with Tahiti and other parts of the colony is irregular. Trading schooners occasionally call and carry mails and cargo, at

approximately monthly or two-monthly intervals. The people of Tubuai formerly owned a schooner, which later passed into the hands of a trading firm in Tahiti.

On Tubuai itself land communication is sufficiently adapted to the needs of the people to render transport by canoe largely superfluous. A good road for vehicles runs round the circumference of the island, and another runs across the island on the western side, joining Mataura to Mahu, through Huahine. Riding horses, pack horses and carts are available for travel. In addition to the roads there are tracks connecting many parts of the island, but most of them are impracticable for carts or even for horses, and travel by them is on foot. Several of these tracks were formerly paved on wet or stony sections.

There is no telephone or telegraphic communication.

RAIVAVAE

Raivavae (formerly known as Vavitao or High island) lies about 96 miles south-east of Tubuai. It is about $2\frac{1}{2}$ miles long and 2 miles wide.

Physical Geography

The island is one of the most beautiful in the Eastern Pacific, consisting mainly of high rugged hills, mostly tree-covered, and rising to 1,434 ft. in Mt Hiro. From the hills there are gentle slopes down to the coast (Fig. 67).

The island is completely surrounded by a barrier reef, on which are numerous wooded islets. There are two passages, both on the northern side, the only practicable one for ships being Tetobe pass to the west, which in 1904 was deepened to $16\frac{1}{2}$ ft. for a width of nearly 200 ft. and a length of a mile. Within the pass there is an anchorage off Mahanatoa village, except in north or north-west winds. Raiurua bay, at the west end of the island, offers excellent anchorage at all times for small steam vessels with local knowledge, and there is a stone jetty at which a vessel drawing 9–10 ft. can lie alongside.

Social and Economic Conditions

Raivavae is noted for its archaeological interest, particularly for its large stone statues, analogous to those of Easter island, though of different appearance. The island is often said to have been discovered by Cook in 1777, but actually appears to have been first sighted by

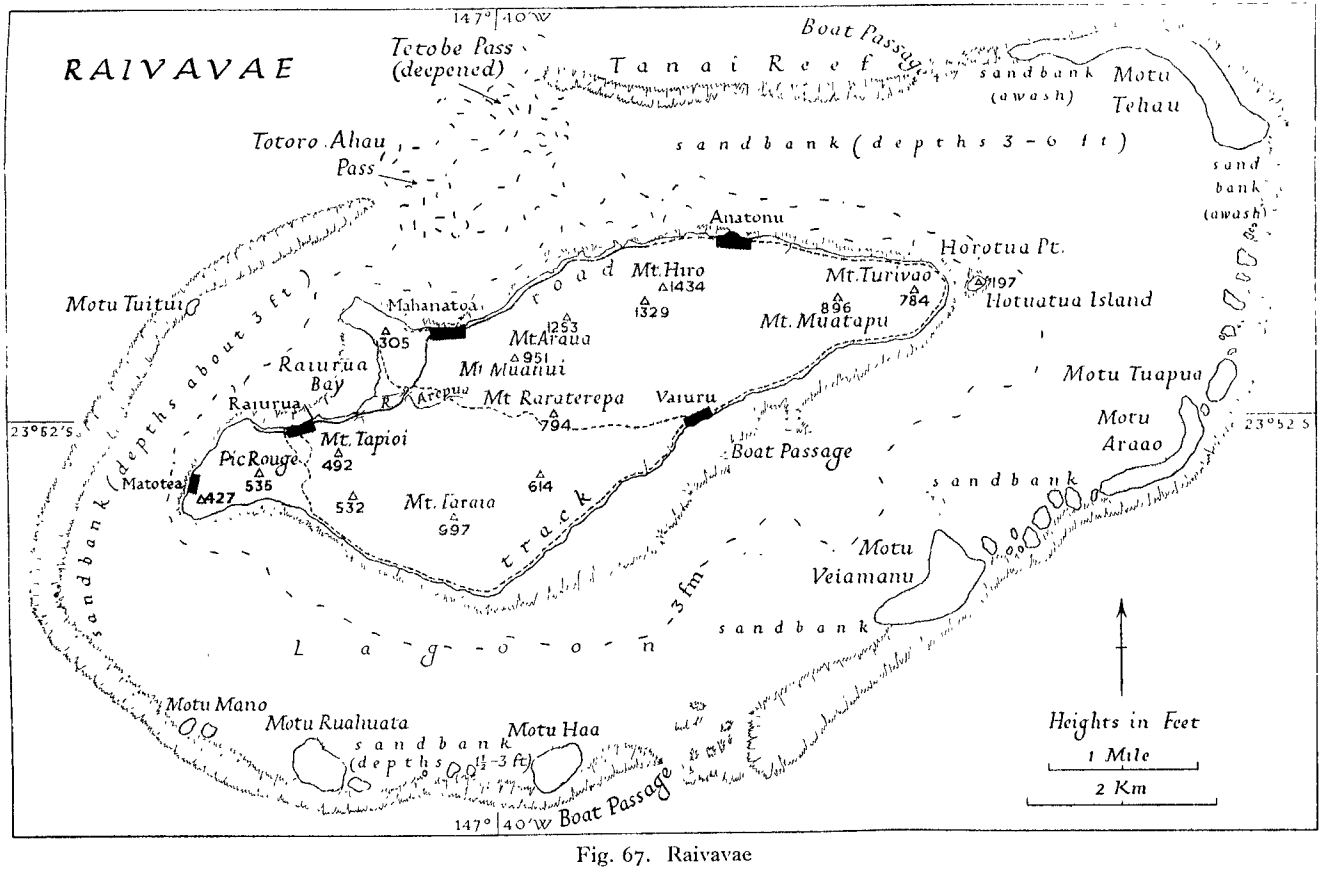


Fig. 67. Raivavae

The lagoon is much encumbered with coral patches and sandbanks, not all of which are shown. Based on: (1) Admiralty chart no. 3461; (2) French Admiralty chart no. 5246.

Gayangos in the frigate *Aguila* and Andía y Varela in the barque *Jupiter* in 1775. Together with Tubuai, it once was claimed as part of the dominions of Tahiti, and was ceded to France by Pomare V in 1880.

The population was about 400 in 1936, including three Chinese merchants, but no Europeans. There are several villages, the most important being Raiurua, on the west.

The island has no great commercial importance, and its relative lack of communications debars the full export of its products. The amount of copra prepared is insignificant, but about 30 tons of coffee are produced per year, about 20 tons being available for sale. The natives barter this coffee with the Chinese. Rates of 2 kg. of coffee against 1 kg. of sugar, and 1½ kg. of coffee against 1 kg. of bread (1 kg. of coffee thus having a value of one franc's worth of goods at Papeete prices) were current in 1935. Bread, the baking of which is done by the Chinese, is eagerly sought by the inhabitants. There is production of oranges and other citrus fruits, but the greater part of the crop is not utilized. Efforts at export of the concentrated juice have been discontinued. Varieties of sandalwood occur, and perfume has been distilled from them in small amount. The ordinary tropical fruits and vegetables serve as food for the people and fish are plentiful in the lagoon. The annual income of the inhabitants was estimated in 1936 at about 20,000 francs, an average of 50 francs per head.

Communications

There is occasional communication with Tahiti by schooner. A road shown on the chart runs round the greater part of the north of the island, but no details are available as to its quality. There is no telephone or telegraph on the island.

RAPA

Rapa (approx. lat. 27° 35′ S, long. 144° 20′ W) is often known as Rapa Iti (Little Rapa) to distinguish it from Easter island, one native name of which is Rapa Nui (Big Rapa). An old name for Rapa was Oparo. The name Rapa Iti is properly applied to an islet in Ahurei bay, and the natives now call the main island Rapa Hue, 'Calabash Beyond', perhaps because of its vague resemblance to the shape of a gourd and its distance from other islands. Rapa lies about 380 miles south-east of Tubuai. It has some importance because it is the nearest of any of the islands of French Oceania to the Panama Canal-New Zealand shipping route, and it has a small but good harbour.

Physical Geography

Structure

The island is roughly horseshoe-shaped with a deeply indented coastline, variously stated to be 15 or 20 miles in circumference. It is of remarkable appearance, being an ancient volcano, the crater of which is the head of Ahurei bay (Figs. 68, 69).

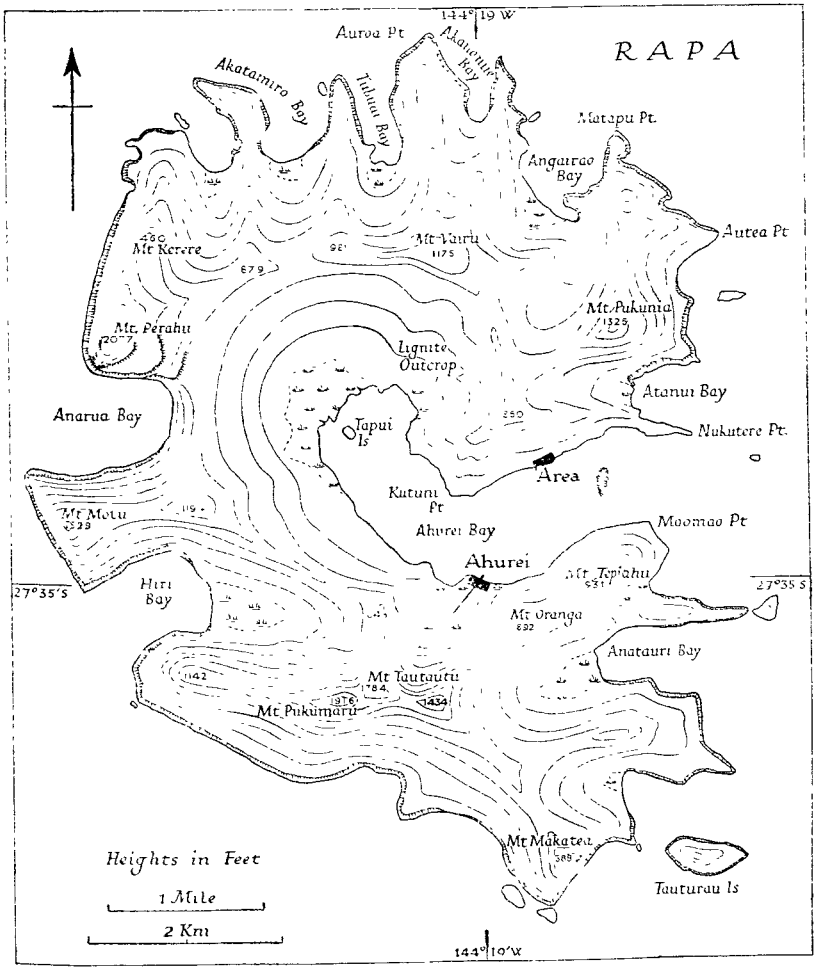


Fig. 68. Rapa

Form lines at intervals of approximately 200 ft. The lignite area is generalized, and its position may not be exactly shown. Based on: (1) Admiralty chart no. 29; (2) L. J. Chubb, 'Geology of the Austral or Tubuai islands (South Pacific)', *Quarterly Journal of the Geological Society*, vol. LXXXIII, p. 295 (London, 1927).

The rampart surrounding Ahurei bay is the main watershed of the island, and from it the inward-flowing streams converge on the head of the bay, descending steeply in a series of waterfalls to emerge in broad swampy deltas. The outward-flowing streams occupy deep steep-sided valleys, which are all embayed by arms of the sea for distances varying from half a mile to a mile from the coast. At the head of each of these bays is a marshy delta. These embayed valleys are separated from each other by razor-backed spurs, which join the circular rampart at its peaks, and thence run radially outwards, generally rising to heights greater than that of the rampart itself and bearing peaks eroded to a pinnacle form. The highest point of the island, Mt Perahu, is close to the shore on the west side and is 2,077 ft. high; Pukumaru peak on the south is 1,916 ft., and there are nine other peaks over 1,000 ft. (Figs. 70, 71).

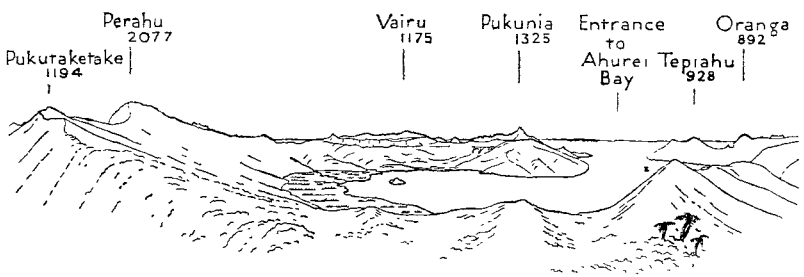


Fig. 69. Panorama of Ahurei bay, Rapa

Viewed from a point midway between Tevaitahu and Pukutaketake. Based on L. J. Chubb, 'Geology of the Austral or Tubuai islands (South Pacific)', *Quarterly Journal of the Geological Society*, vol. LXXXIII, p. 316 (London, 1927).

Coast and Anchorages

The seaward ends of most of the spurs are truncated by nearly vertical cliffs generally triangular on the face. Round the greater part of the circumference of the island the shore is thus rocky and steep, and the waves break against the base of the cliffs. At the head of the bays, however, are beaches. These are composed either of pebbles of volcanic rock mixed with fragments of marine organisms, or of alluvial mud and sand, the latter containing pockets of highly magnetic material.

Being well out of the tropics, Rapa has no barrier reef or fringing reef of coral, though patches of coral occur. The best anchorage is in Ahurei bay, a good harbour on the east side; it is protected by islets and reefs of rock from the prevailing easterly winds, but the

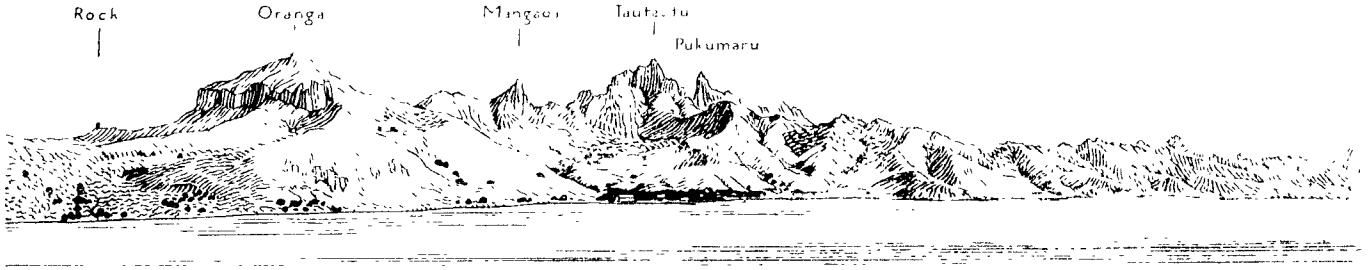


Fig. 70. South side of Ahurei bay, Rapa

The settlement of Ahurei, with its prominent church, is in the centre of the picture, though largely hidden by dark masses of trees. Other trees occur as dark patches on the slopes. The pinnacle on the skyline to the left is often known as Remarkable Rock.



Fig. 71. Ahurei bay, looking towards the head

Both figures based on photographs by Major A. J. A. Douglas, *St George* expedition, 1924–5.

entrance is narrow, with considerable foul ground. The harbour is about 1,000 yd. wide and penetrates deep into the land for about 2½ miles, almost dividing the island in two. It was formerly used as a coal depot for a line of steamers running between New Zealand and Panama. Anchorage can be obtained in from 10 to 29 fathoms. There is a landing place on the south side of the bay, at the village of Ahurei, where there is a stone jetty with a depth of 1 ft. at low water. There is also a small jetty at Area, on the north side of the bay. Other bays are used as steamer anchorages, but access to them is rendered difficult by shoals and scattered coral formations.

Climate and Vegetation

From the latitude, the climate of Rapa is very different from that of most of French Oceania. It is temperate and moist, rains being frequent and cloud and fog not uncommon, even when the weather is fine some miles offshore. The temperature seldom rises above 73° F. (in March) or falls below 58° F. Prevailing winds, from October to April inclusive, are from the east, but from December to February inclusive west winds occur about once in three weeks; from May to September west winds with showers prevail. Gales of a cyclonic character, though not common, may occur at any time of the year, and hurricanes are sometimes experienced.

The flora of the island is distinctly stunted as compared with that of the warmer islands to the north, and many useful species, notably the breadfruit and the papaya, are lacking. There are some coconut palms but their fronds are small and their fruit useless. Oranges, mangoes and bananas have been introduced and do well. The mountains on the east side of the island tend to be either covered in a poor vegetation, or bare, owing partly to grazing by animals and partly to the habit of the Rapa people of burning off the growth. Large sections of the burnt-off areas are now covered in long grass. But most of the higher peaks and upper reaches of the major valleys, particularly on the west side, have a rich growth, and in parts are densely wooded. The candlenut is a conspicuous tree in the forest, there are notable groves of tree ferns, and the trees are thickly covered in mosses and lichens. Pandanus, which resists the wind, is widespread.

Social and Economic Conditions

Rapa was discovered by Vancouver in 1791. It was taken under French protection in 1867 and was annexed in 1881, being attached

for administrative purposes to the Austral group in 1887. Authority is exercised by a French gendarme living at Ahurei bay, and by a native chief, who acts as president of a small native district council.

The population, like that of the Marquesas, has suffered severely from introduced epidemic and other diseases, while the depredations of Peruvian slavers, and alcohol, distilled locally from the root of a *Cordyline* (a plant rather similar to a small palm), caused further reduction in the numbers of the people. Vancouver in 1791 estimated the population at 1,500; Davies the missionary estimated it at 2,000 in 1826. But in 1834, when Moerenhout arrived, there were only about 300. In the census of 1911 there were only 182 people, but their numbers have increased since, and at the end of 1935 there were 266 inhabitants.

A characteristic feature of the island, and one which demonstrates the former larger population, is that all the accessible mountain summits and all the principal passes from one valley to another are commanded by well-constructed stone forts (Plate 54), built in the form of flat terraces, with a fosse, and usually overlooked by a tower. These forts were built by ancestors of the present people, but are uncommon in Polynesia. They have their analogy, however, in the earth-hill forts built by the people of the Marquesas, Tahiti, and Raiatea as well as by the Maori of New Zealand. According to local tradition the Rapa people were formerly divided into a number of tribes, among whom there was continual warfare for the possession of the fertile valleys capable of producing taro, the essential foodstuff. But not long before the advent of mission teaching, ascendancy over the whole island had been gained by one prominent chief.

The natural resources of Rapa include a deposit of coal on the north side, at an elevation of 600–800 ft. It is lignite of poor quality; though valueless for marine boilers, it might be used for industrial purposes but it would be costly to extract. No serious attempt, however, has been made to work the deposit, and its extent is unknown.

The primary occupations of the islanders are agriculture and fishing, but many of the men, who are excellent sailors, take up work on schooners and other vessels. One of the results of this is that there tends to be an excess of women on the island. Taro is the chief agricultural product and grows abundantly, the old terraces and irrigation works of former generations still being used to some extent. Oranges, bananas, potatoes and other European vegetables are cultivated to a limited degree. The large areas of grassland could support many sheep and cattle, but pastoralism has not been developed,

though horses and wild goats are common. In 1939 there were about 50 head of cattle. The absence of a barrier reef has forced the men to go out into the oceanic waters for fishing; whale-boats have now replaced their former canoes there. Coffee is the main article of export; about 24 tons were produced and shipped in 1935.

There are two villages on the island, Ahurei being the principal one. The houses of the people, built on a timber framework, thatched with grass, are almost hidden in a mass of orange, coffee and other trees, but the large white church is prominent (Plate 55). Area, the other village, on the north side of Ahurei bay, used to be a sub-district, but is now merged for administrative purposes with Ahurei. Formerly Tubuai (or Tupuai), in a little valley on the north side of the island, was also inhabited, and a sub-district, but it has been abandoned for many years.

Communications

Communication with the island is infrequent, and is maintained primarily by the occasional visits of a trading schooner, perhaps twice a year. A French naval vessel from Tahiti was said at one time to bring stores quarterly, but it is doubtful if this service still continues.

Apart from a short length of raised grassy road at Ahurei, inland communication is by steep muddy tracks. Outrigger canoes are used round the shores of Ahurei bay. There is no telephone. A small W/T set is reported to be owned by a trader, and capable of communicating with Tahiti.

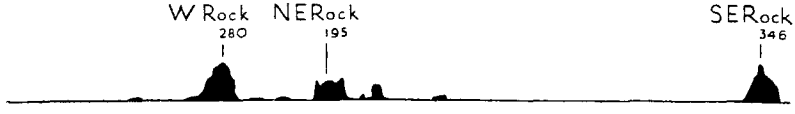


Fig. 72. Silhouette of Marotiri

View from south-west, distant about 5 miles. Heights in feet. Based on L. J. Chubb, 'Geology of the Austral or Tubuai islands (South Pacific)', *Quarterly Journal of the Geological Society*, vol. LXXXIII, p. 303 (London, 1927).

MAROTIRI (BASS) ISLANDS

This group, lying about 50 miles south-east of Rapa (in lat. 27° 55′ S, long. 143° 26′ W), consists of nine small islets of rock. The highest is 346 ft. above sea level. All are abrupt and without vegetation or low ground. A silhouette is given in Fig. 72. The greatest diameter of the group is about 2 miles, and rocky surroundings exist for about a

mile around. The islets are uninhabited, and have no economic or strategic value though the men of Rapa have sometimes visited the area for fishing.

BIBLIOGRAPHICAL NOTE

The two best sources for the Mangareva group are Te Rangi Hiroa (P. H. Buck), 'Ethnology of Mangareva', *Bernice P. Bishop Museum Bulletin*, no. 157 (Honolulu, 1938); K. P. Emory, 'Archaeology of Mangareva and Neighbouring Atolls', *Bernice P. Bishop Museum Bulletin*, no. 163 (Honolulu, 1939). Both works give some general geographical information.

The best physical description of the Austral islands, including Rapa, is given by L. J. Chubb, 'The Geology of the Austral or Tubuai islands (Southern Pacific)', *Quarterly Journal of the Geological Society of London*, vol. LXXXIII, pp. 291–316 (London, 1927). Some information is also given by P. Marshall, 'Notes on the Geology of Moorea and Rurutu Islands', *Proceedings and Transactions of the New Zealand Institute*, vol. XLVI, pp. 281–3 (Wellington, 1913), and by H. E. Gregory, 'Report of the Director for 1934', *Bernice P. Bishop Museum Bulletin*, no. 133 (Honolulu, 1935). Brief general data on the geology, flora, etc., of Rapa are given by E. C. Zimmermann, 'Cryptorhynchinae of Rapa', *Bernice P. Bishop Museum Bulletin*, no. 151 (Honolulu, 1938). A very useful description of Rapa and its people, written in 1912, is given by A.-C. Eugène Caillot, *Histoire de L'Ile Oparo ou Rapa* (Paris, 1932).

A good impressionistic account of Rurutu and Rapa, and their inhabitants, is given by A. J. A. Douglas and P. H. Johnson, *The South Seas of Today* (London, 1926). A detailed analysis of the culture of one Austral islands people is given by R. T. Aitken, 'Ethnology of Tubuai', *Bernice P. Bishop Museum Bulletin*, no. 70 (Honolulu, 1930). Some account of ancient stone work in the area and of the remarkable forts of Rapa is given by S. and K. Routledge, 'Notes on some Archaeological Remains in the Society and Austral Islands', *Journal of the Royal Anthropological Institute*, vol. LI, pp. 438–55 (London, 1921).

For maps see Appendix I.

Chapter VII

THE MARQUESAS

Physical Geography: The People: Administration and Social Services: Economics: Communications: Hivaoa: Tahuata: Fatuhiva: Mohotani: Fatuuku: Nukuhiva: Uapou: Uahuka: Eiao: Hatutu: 'Coral' Islets: Motu Iti: Bibliographical Note

The Marquesas (Fig. 73) consist of ten islands and a few islets comprised in two tolerably distinct groups, a north-western and a south-eastern group, discovered at different times and for many years bearing distinct names. They lie between latitude 7° 50′ and 10° 35′ S, and longitude 138° 25′ and 140° 50′ W. No complete survey has been made of the islands, and accurate figures of their dimensions are not available. Their total area is given sometimes as 491 sq. miles, and again as 459 sq. miles, but is possibly less than this. A conservative recent estimate* gives some approximate dimensions as follows:

	Area sq. miles	Length max. m.	Breadth max. m.	Greatest altitude ft.
Fatuhiva	30	9	4·5	3,670
Mohotani	6	5	1·5	1,700
Tahuata	20	9	5	3,280
Hivaoa	125	25	8	4,130
Fatuuku	0·5	1·5	0·5	1,180
Uapou	40	9	8	4,040
Uahuka	30	9	5	2,805
Nukuhiva	130	16	12	4,000
Eiao	20	8	4	2,000
Hatutu	7	5	2	1,380

This gives a total area of approximately 408 sq. miles.

PHYSICAL GEOGRAPHY

Structure

With the doubtful exception of two small 'coral' islets in the extreme north, the Marquesas are all high islands of volcanic origin. There are no active volcanoes, and the group is not subject to earthquakes. Sulphurous emanations and deposits at Tehutu on Hivaoa, and a

* A. M. Adamson, 'Marquesan Insects: Environment', *Bernice P. Bishop Museum Bulletin*, no. 139, p. 10 (Honolulu, 1936).

few mineral springs, as that at Taiohae in Nukuhiva, giving a clear sulphurous-smelling water, and that at Taaoa in Hivaoa, giving a ferruginous water of high density and astringent flavour, may represent remnants of volcanic activity.

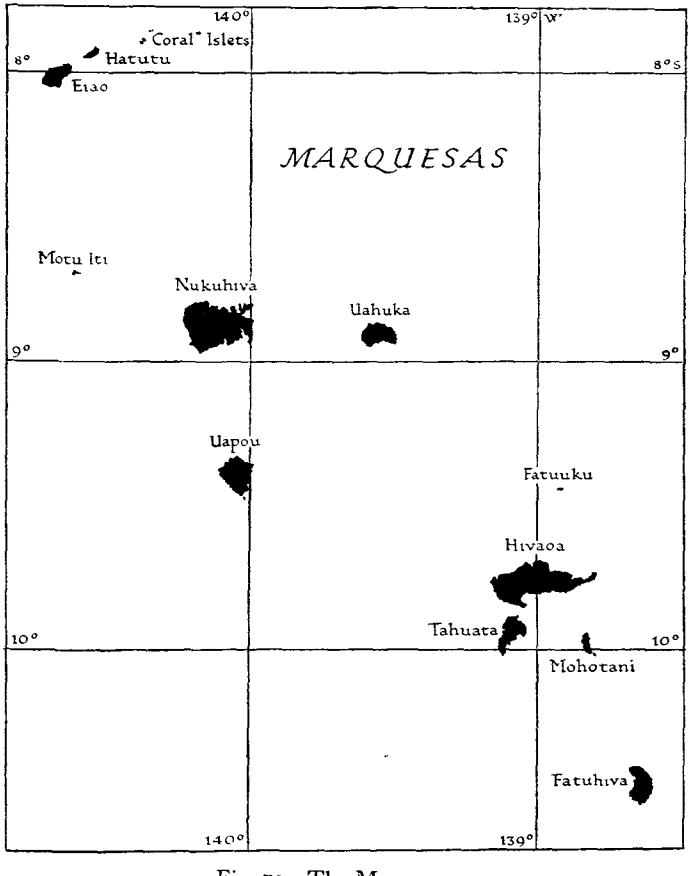


Fig. 73. The Marquesas

Based on Admiralty chart no. 1640.

The geological history of the islands is not yet clear, but the evidence of raised terraces on the one hand and of drowned valleys on the other points to periods of elevation and of subsidence, though their precise degree has not been finally determined. The extent of erosion indicates that the Marquesas are probably not youthful as compared with other central Pacific islands. The exposed rocks are mostly basaltic lavas, with some red tuff, scoria and conglomerates.

Apart from recent alluvial deposits, beaches and a few tiny coral reefs, rocks of sedimentary origin are extremely rare.

In relief the islands are extremely rugged, owing to erosion and to faulting, which appears to have been more marked here than in most of the other Polynesian groups. Physical and chemical action has formed many rocks into strange shapes, and in some cases they seem to be in unstable equilibrium. On most of the islands there is a central mountain range, from which ridges run down to the coast. There are no true coastal plains; almost everywhere the coastline is cliffed and in some places the precipices rise to more than 1,000 ft. above the sea (Plate 56).

In general character three of the inhabited islands, Fatuhiva, Tahuata and Uahuka, are very similar in structure, with a high central semicircular range, fairly uniform in crest, extending along the greater part of the interior. On the inner side of the semicircle there are abrupt slopes into a few wide valleys which have comparatively large streams, while on the outer side the slopes are more gradual and are cut by numerous V-shaped valleys, with small, mostly intermittent streams. In none of these cases are there extensive areas of level country above the valley floors. Each of the three other inhabited islands, Hivaoa, Nukuhiva and Uapou, has distinctive features. Uapou, the smallest, is marked by a short central range with many secondary ridges, crowned in many cases by striking lofty pinnacles. A great part of the interior of Nukuhiva is occupied by a wide central depression, a plain between 2,000 and 3,000 ft. above sea level, nearly surrounded by high mountains from which many deep valleys lead down. Hivaoa has two separate mountain systems, a high semicircular range towards the west and a lower central range along the narrow eastern part of the island, with a series of plateaux up to 2,000 ft. in elevation, fissured by numerous ravines. On the four uninhabited islands, Mohotani, Eiao, Fatuuku and Hatutu, there is no elevation more than about 2,000 ft. Fatuuku is a rocky small island, with a flat summit in the western half, Hatutu has a high interior sloping towards the west, while Eiao and Mohotani have plateau surfaces sloping on the whole from east to west.

The larger islands are marked by a succession of deep valleys, some of which take the form of magnificent amphitheatres, the greatest being at Atuona on Hivaoa, with a width of 2 miles and sides as high as 4,000 ft. Most of these valleys have small deltaic flats at the mouth, only slightly higher than the beaches, and above the flats gentle slopes rise to the base of the surrounding mountains and end



Plate 54 Ancient fort at Morotonga, Rapa

The fort with its terraces is situated on the crest of a ridge and commands a wide outlook over the steep rugged hills



Plate 55. Cultivation at Ahurei, Rapa

The light patches indicate water lying in the fields of taro, which grows best in swampy ground. The houses of the settlement are mainly hidden among the trees

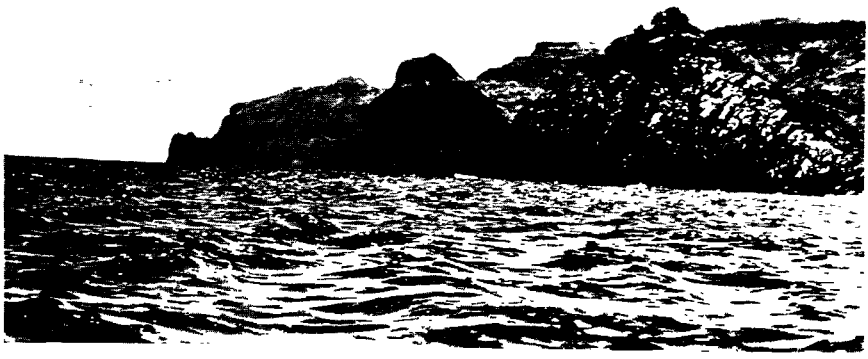


Plate 56. Coast of Nukuhiva, Marquesas

Rugged black basalt cliffs are characteristic of most of the Marquesan coastline.

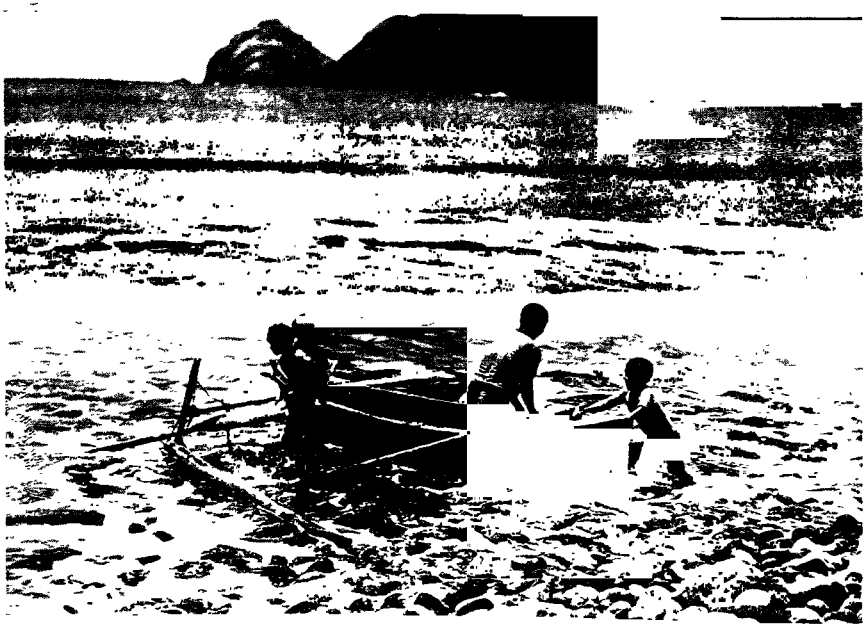


Plate 57. Native canoe in Taiohae bay, Nukuhiva

This is a modern type of Marquesan canoe, though the single outrigger is in native style. Besides the pebble beach shown here, there are other beaches of sand in the bay.

in lofty cliffs. Other large valleys are narrow and deep, of the canyon type, and many of them have been sufficiently eroded to have acquired flat floors. In some areas, especially on the south coast of Nukuhiva, valleys have been cut off and hang at about 750 ft. above sea level, with cascades falling from them in rainy seasons. But almost all the valleys of considerable depth reach sea level, and most are drowned at their mouths, thus forming the series of superb bays which characterize the Marquesas.

Coastline

The coastline of the Marquesan islands is extremely rugged, the most spectacular feature being the great lines of cliffs, which are unbroken except for short stretches of beach at the heads of the bays, and which attain at times a height of more than 1,000 ft., with an almost perpendicular slope. Grottoes, chimneys and blowholes, carved out by wave action, are common in the coastal rocks, while occasionally huge tumbled masses of rock occur, cemented by sedimentary or coralline material. The highest cliffs appear to have been formed by faulting, though some of the lower cliffs, as those of western Fatuhiva or of Uapou, may have been due to marine erosion.

The actual shores of the islands are almost all rocky, with deep water at the base of the cliffs, though a shore shelf, up to 10 ft. above the level of high tides and mostly only a few feet wide, is common. In general, large vessels can approach very close to the shoreline. On the windward side of the islands a heavy surf is an almost constant feature.

The inhospitable character of the coastline as a whole is redeemed, however, by the many deep bays. The shoreline of these bays is also for the most part rocky and precipitous, but as a rule each has one or more beaches of black sand or shingle (Plate 57), derived from volcanic rocks, with only a small admixture of coral fragments and shells. Where, however, no permanent stream enters the sea, coral and shells may be predominant, and the beach may be white. Most of the bays have a sandy bottom, with a little coral on the westerly sides, which are more sheltered from currents.

Coral formation in the Marquesas, however, is comparatively scarce, when its profusion in most of the other Pacific island groups is considered. There are, for instance, no barrier coral reefs, and only a few very small fringing reefs, mostly in the bays of northern Tahuata, the largest of them being less than half a mile wide. The

absence of large coral reefs in the Marquesas, in such striking contrast to those of the neighbouring Tuamotu group, has been a subject of much speculation. The reasons have not yet been finally determined, but the precipitous nature of the shores with the great depth of water off them, and the westerly flow of the currents with periodic chilling of the surface waters, have been advanced as possible factors. (Further details of topography and coastline are given when the individual islands are described.)

Anchorages

Anchorages in the group are numerous, though few of them are sheltered from the ocean swell. But most of the islands have at least one anchorage that will serve under given conditions of wind or sea. In Hivaoa the harbours of Puamau, Hanaiapa, Hanamenu and Taahuku are fairly good, but the best harbours are in Nukuhiva, in Controleur bay and Port Taioa. There is also a good harbour at Haave bay in Uahuka.

Climate

The climate of the Marquesas is healthy and fairly pleasant, though with a high degree of humidity for most of the year. The meteorology of the islands, however, has not been studied in great detail.

The trade winds blow with great regularity, both in velocity and in direction, though there is some variation between north-east and south-east. In general from April to October they prevail between east and east-south-east or south-east, and for the rest of the year between east and north-north-east. The south-east trades are the stronger and more regular, and bring the most agreeable weather; those to the north of east are more irregular, and days of calm, with consequent rise of temperature, are more frequent, though even then they are not common. High winds, generally from the north or north-west, are rare. From about 1900 to 1930 only three storms severe enough to blow down breadfruit trees are recorded, and no definite evidence of hurricanes is known. In 1902 or 1903 a series of so-called tidal waves reached the south coast of Hivaoa, flooding Taahuku valley for about half a mile and destroying some houses. They were probably due to submarine earthquakes.

The range of temperature at sea level is narrow, the mean annual range (the difference between the monthly means for the hottest and the coolest months) being only 3·8° F. at Atuona on Hivaoa in 1930.

For the hottest month, November, the mean maximum was 91·6° F. and the mean minimum 72·9° F.; for the coldest month, August, the corresponding figures were 89·1 and 71·8° F. The mean annual temperature was 78·4° F. On other islands to the north-west the means of temperature are slightly higher, due to the difference of latitude. Altitude also has its effect, the monthly means at a station 2,000 ft. up on Nukuhiva being 5–6° lower than those at sea level, and in the cloud zone on the crests of the larger islands the temperature may almost be described as temperate rather than tropical. In the inhabited valleys of the lower levels the warm sea breeze during the day is followed at night by the cooler land breeze from the mountains, and conditions are thus rendered more pleasant.

Cloudiness varies greatly according to altitude. At Atuona in 1930 the average of the monthly means was 33 % of cloudiness, but whereas at sea level the sky is seldom completely overcast, on the six higher islands there are almost always clouds over the mountains, which are frequently enveloped from their summits down to 3,000 ft. or lower.

Relative humidity is constantly great, seldom falling much below 80 %, and being higher at night.

Rainfall

The most striking features of the Marquesan climate are the great variation in annual rainfall, and its uneven distribution. Precise data are few, but it would seem that in wet years the rainfall is well over 100 in., in moderately rainy years it is over 50 in., whereas in dry years it is probably much less than 40 in. At wet periods monthly totals of 21 and 23 in. have been recorded, while on 15 January 1930 a fall of just over 6½ in. was noted, at Taiohae in Nukuhiva. At such times the rivers may be in a state of flood for a long time. On the other hand, there may be intense periods of drought. According to local residents there was an alternation of wet and dry periods from about 1903 to 1931 as follows:

Wet years	Dry years
1903–1906	1908–1910
1911–1917	1918–1928
1929–1931	1931... (new dry period began)

During the dry period of 1918–28 conditions of extreme aridity prevailed at low levels. The vegetation of exposed areas withered, the production of copra greatly diminished, and many young coconut palms and vanilla plants were killed, and in the western region of Uahuka many semi-wild horses perished. The stem structure of food

plants and native trees, however, fails to reveal marked periods of retarded growth, such as prolonged drought would be likely to cause, and it is possible that the continuity of the really dry periods has been exaggerated. Seasonal variations in rainfall are not well marked, and are much less well defined than in most of the other central Pacific groups. But there is a tendency for the period from May to September to be the season of most rain, and for that from October to April to be the drier season.

A feature of interest is the uneven distribution of the rainfall as among the different islands and even between districts of the same island. Since the trade winds bring the rain, much of which is caught by the high mountains, precipitation is much heavier at the windward than at the leeward end of the larger islands. On Hivaoa and Nukuhiva, consequently, the flora decreases in luxuriance from east to west, and the western end of Nukuhiva is covered by a low prairie vegetation of scattered trees and shrubs and grassland. Rainfall also differs considerably on the various islands for the same reason. Fatuhiva, which is first reached by the trade winds, is the wettest; Uapou, sheltered by the islands to the south-east, is the driest, though there is rain forest in the central elevated portion. Uahuka is also fairly dry, owing to the absence of high mountains, though even here precipitation is sufficient to preserve remnants of a rain forest along its interior crests and peaks.

Water Supply

Though there are many large valleys in the Marquesas, the streams are for the most part insignificant except after heavy rain. Many of them are intermittent in their lower reaches, drying up completely in times of drought or continuing underground to the sea, appearing only here and there as springs. The only rivers much more than 5 miles long are those which enter the sea at Taahuku on Hivaoa, and at Taipivai and Hakaui on Nukuhiva. On Tahuata there is only one stream that flows permanently above ground to the sea, Mohotani and Eiao have each a single permanent stream and a few springs, on Fatuuku there is a spring which is said to persist through periods of drought, but on Hatutu no permanent sources of water are known. The beds of most of the streams are stony.

On the larger islands, there is abundance of water for drinking and domestic purposes. For vessels the only method of obtaining water in most places is by containers in ships' boats. But at Taiohae water is piped to the pier, with a delivery estimated at 8 tons per hour.

Many native homes are supplied with running water from streams by means of hollow bamboo pipes.

There are no lakes in the Marquesas, and no permanent pools of standing water appear to exist. Marshy regions exist in parts of Nukuhiva. They are of small extent and probably subject to desiccation.

Vegetation and Fauna

The soil on the greater part of the Marquesan islands is red, reddish-brown or yellow, porous and fertile. On much of the island of Uapou, and in the central depression of Tovii and the mountains round Taiohae, on Nukuhiva, however, soil of a white or greyish-white colour exists; it is finely divided, less permeable than the reddish soils, and comparatively infertile.

The vegetation of the larger Marquesan islands may be divided into three zones, primarily determined by altitude and rainfall.

(i) Low levels from the shore up to 1,000–1,500 ft., and regions of low rainfall up to 2,000–2,500 ft., characterized by a dominance of introduced species and of species widely distributed. Forests with some tall trees and a thick undergrowth occupy many valleys and even exposed slopes; the common hibiscus, the Tahitian chestnut, the pandanus, the guava, species of *Ficus*, the coconut palm and the breadfruit are characteristic trees, with many shrubs, herbs and grasses, but few ferns. Over large areas, however, especially in the barren leeward regions of Hivaoa and Nukuhiva, the vegetation is meagre and drought-resisting. The casuarina, *Pisonia* and *Ficus* are characteristic trees here, with low scrub of guava and other shrubs on the slopes, and much tall grass. In many places of this type, especially above 1,000 ft., all other vegetation is replaced by *Gleichenia* fern. In the strand flora a kind of hibiscus, *Thespesia populnea*, and *Cordia subcordata* are the most prominent trees, with the goat's-foot convolvulus the most conspicuous herb along the beaches.

(ii) Intermediate zone of moderately heavy rainfall, from 1,000–1,500 to 2,000–2,500 ft. The characters and vertical limits of this zone are not sharply defined, but in general its flora is characterized by a dominance of a common hibiscus, and the abundance of low trees and shrubs, including pandanus and the palm-like *Cordyline terminalis*, with a luxuriant undergrowth of grasses and ferns. Many open spaces are occupied by the *Gleichenia* fern and *Paspalum* grass, in what are probably secondary associations following deforestation.

(iii) Mossy forest of the cloud zone, 2,000–2,500 ft. and upward to the summits of the mountains, forming an almost continuous and very dense covering. There are few tall trees, but tree ferns of 50 ft. or more in height often stand out above the rest of the forest. The branches of the trees are almost everywhere covered thickly in mosses and ferns, especially filmy ferns and the bird's nest fern, and ferns usually predominate in the dense undergrowth in sheltered places. On wind-swept ridges and slopes the forest is in many places reduced to a low, dense scrub, with abundant ferns and sedges of several kinds, and in some of the deep gulches and heads of valleys the wild banana (*Musa fehi*) stands in groves. Many of the species in the cloud zone do not grow at lower levels, though on the borders of the zone bamboo, banana, guava and *Paspalum* grass occur, these having been introduced at various times.

On the uninhabited islands the altitude is not sufficiently great for the development of well-defined zones of vegetation, the entire flora being similar to that of the lowland zone of the higher, inhabited islands, and comprising species of wide distribution, often of a drought-resisting type. On these as on the larger islands much vegetation has been destroyed by introduced grazing animals, and by the *Paspalum* grass, a recent immigrant, which is spreading rapidly into the forest.

The flora of the Marquesas as a whole is rich, but the number of indigenous types is small compared with that of the varieties introduced by the Polynesian inhabitants and developed by them in the course of cultivation. There are also many plants introduced by Europeans.

The indigenous fauna of the Marquesas is very limited, comprising primarily a few species of lizards and fifteen species of land birds, including the blue heron, a rail and fruit-eating pigeons. Until the coming of man, no mammals appear to have been present, not even the bat. There are now a number of introduced types, including grazing animals, pigs, cats and dogs, and types of Polynesian rat. Fowls have also been introduced, and are common.

Among insects a type of sandfly known as *nono* is peculiar to Nukuhiva; it gives a bite which is very troublesome and may even cause a slight fever.

THE PEOPLE

Population

Early estimates of the native population are unreliable, but at the beginning of the nineteenth century it may well have been over 50,000. By 1842, after extensive and on the whole unprofitable intercourse with Europeans, it was about 20,000, according to the careful estimate of Du Petit-Thouars. Thirty years later the population was about 6,200; in 1911 it was 3,116 (including 146 Europeans and Americans), and in 1926 it was only 2,225 (including 131 non-natives). The reduction of the native population to one-tenth within a century has merited the description of the story of the Marquesas as one of the most tragic and sordid in the history of the South Seas. Venereal disease, tuberculosis, leprosy, alcohol and opium were primarily responsible for the decline. Remedial measures by the French administration were long in being applied, but since 1923 medical services have been increased, a hospital was established at Atuona in 1924, and a leper asylum at Tehutu. Leper settlements have also been reported as established at Atuona, Taiohae and Puamau. Since 1924 there has been a small excess of births over deaths each year, and in 1931 the population was given as 2,283.

There has been some racial intermixture, but to a much smaller degree than in Tahiti. Relations with Europeans in the early years of contact gave some offspring of mixed blood. Some fifty Chinese arrived for work in 1867, and their numbers have been roughly maintained since; some intermixture between them and Marquesans has occurred.

Only six of the islands are inhabited, the most important being Hivaoa and Nukuhiva. The distribution of population in 1931 was approximately as follows:

Hivaoa	800	inhabitants	Fatuhiva	200	inhabitants
Nukuhiva	550	,,	Tahuata	250	,,
Uapou	300	,,	Uahuka	150	,,

The uninhabited islands are difficult of access, with poor anchorages; on two of them, however, Eiao and Mohotani, commercial firms have since 1927 made some provision for labourers.

Physical Type

The Marquesans are among the taller and lighter skinned Polynesian groups, though they are on the whole not so tall as the Tongans,

nor so pale brown in skin colour as the Samoans. In stature a sample of rather less than 200 adults gave an average of 5 ft. 7 in. (170·3 cm.) for the men, and 5 ft. 3 in. (160·7 cm.) for the women. They are usually rather massively built.

The Marquesan head is apt to be long but wide. The cephalic index shows a fairly high ratio of length to breadth, the index for men averaging 79·4 and that for women 82·0. There is some possibility that deformation of the head was practised in the past, the skull being moulded artificially by massage. The hair of the Marquesans is wavy, more so than that of the Tongans or Samoans, and varies in colour from black to dark brown, sometimes with a reddish tint visible in certain lights. The eyes are dark brown, with some traces of epicanthic fold. The face as a whole is high and wide. Physically the people are still a fine group, despite their decimation by disease; the men have a splendid muscular development.

Language

The Marquesan language is one of the Polynesian group, with affinities with Maori as well as with Tahitian, its more immediate neighbour. It has much the same consonants as Tahitian, and like this employs the glottal closure but not the *ng* sound which is common in many other parts of Polynesia. Unlike Tahitian, however, it uses *k*, but does not use *r*.

In pre-European days each major island tended to have small peculiarities of speech, which were sufficiently marked between the northern and southern islands of the group to merit classification as dialects. The principal differences here were that the southern dialect tended to drop the *k* from a number of words in which the northern dialect used it, or to replace it by *n*, and to replace the *h* in a number of northern words by *f*. Thus the northern word for 'bay' is *haka*, the southern word is *hana*; the northern word for 'head' is *upoko*, the southern word *upo'o*: the northern word for 'dwelling house' is *ha'e*, the southern word is *fa'e*. In vocabulary, too, there were some differences. The northern dialect used *ma'ama* for 'moon'; the southern dialect, '*mahina*', both being words used elsewhere in Polynesia but usually in separate regions.

In the modern Marquesan speech these dialectal differences have tended to break down, though despite the frequent contacts with Tahiti the language as a whole has maintained itself fairly well. With some Tahitian expressions incorporated, it is used in letter-writing.

Ancient Culture

The Marquesans are Polynesians, their culture in former times having many similarities to that of the Maori of New Zealand. Regional differences in culture existed between the various islands, in particular between the northern and southern groups, the former being dominated by Nukuhiva as the latter was by Hivaoa. But the general pattern was such as to allow one to speak of the culture of the people as a whole.

When they first came into contact with Europeans, each valley in the principal islands was inhabited by one or more tribes, often at war with one another, but always allied against the people of other valley groups. Each tribe had its chief or chiefs, sprung from important families, but their authority had not reached the height of that in some other Polynesian communities, nor was it so deeply associated with the religious organization. Only on Uapou was the authority of a single chief recognized over the whole island. In the northern islands hereditary chieftainship was the rule. Warrior chiefs and priests serving as the mediums of the gods also played an important part in the social structure. The land was essentially held on a tribal basis, administered by the chief, but some degree of individual ownership also existed, especially in gardens and fruit trees.

For reasons not satisfactorily explained Marquesan populations appear to have been marked by a considerable excess of males over females. Associated with this was the practice of polyandry, whereby a woman in addition to her principal husband had other secondary husbands, who shared in the work of the household and in the woman's favours. This practice, socially sanctioned, does not seem to have aroused the resentment of the principal husband, who in fact welcomed it as increasing the economic strength of his establishment and in consequence his wealth and prestige. The social position of women, as might be expected in such a society, was high.

The character of the natural environment obviously had exercised an important influence on the culture of the people. The isolation of the deep valleys, comparatively inaccessible by land, would seem to have been in part responsible for the strongly individualistic tribal development, continuous warfare and lack of a national political organization, such as existed in Tahiti, Tonga and Hawaii. In agriculture, while coconut, breadfruit, taro, banana and sugar cane were cultivated, the region was not particularly suitable for extensive

cropping. Taro was grown on the valley floors and also on the hill sides, with some terracing and irrigation, but the people had to depend on tree crops rather than on vegetable crops. Breadfruit was the staple food, and was preserved in storage pits which allowed it to be kept for several years; this also acted as a provision against drought, which was often severe. Apart from food, the breadfruit tree also yielded a bark used for making cloth, a wood used in carpentry, and leaves utilized for thatch. At least thirty-three different varieties of the breadfruit were distinguished by the people, an index of the importance of it to them. Twenty-six varieties of the banana were recognized, and eleven varieties of coconut.

The absence of reefs round the islands made it necessary that large-scale fishing should be of the deep-sea type rather than of the shallow-water type practised in Tahiti and the Tuamotu archipelago. Single-outrigger fishing canoes were used, and also large canoes, often joined into a double canoe by a connecting platform; the latter were able to hold about fifty men. Agriculture and fishing were supplemented by the taking of wild pigs and birds. Cannibalism was practised, not only for ritual reasons, but often from a simple desire for flesh food.

There are no legends of immigration into the group by ancestors of the present people, and their culture would seem to have been of long development. The Marquesans were notable for the high standard of their arts and crafts, especially in their wood carving, stone work and tattooing. Their stone work, apart from images in conventionalized human form, comprised structures of mainly three kinds: house platforms; places for ceremonial use, often for burial, akin in type to the temples found generally in eastern and central Polynesia; and places of public assembly, with a dance floor. Since of necessity all these were often built on sloping ground, they commonly assumed the form of a terrace, with a stone wall on one or more sides. Many of them are still to be seen in a more or less ruined state in the islands. One of the largest, the place of assembly at Uahakekua in the Taipi valley, has a dance floor 363 ft. long, with stone walls and stone platforms around. In tattooing as in wood carving the Marquesans used elaborate geometrical designs. Tattooing of the face and body was common until forbidden by the French in 1884. Even then, in the absence of authority to enforce the edict, the practice continued for a number of years afterwards on Hivaoa, Tahuata, Uahuka and especially Fatuhiva.

Modern Culture

In general, after more than a century of European contact, much of the native culture of the Marquesans has disappeared.

Few old-style houses remain, most of the dwellings being now small two-roomed structures of planks, with roofs of corrugated iron. The dress of the people is now entirely of European cloth. *Popoi*, a paste of breadfruit, is still the staple food, but rice, sugar, coffee and other imported foods are also used. In the social sphere some of the ancient customs in connexion with adoption and mourning survive still. But though the Marquesans are classed as subjects of France, and have been under French control for so long, they still preserve a strong sense of local community feeling.

ADMINISTRATION AND SOCIAL SERVICES

The islands of the Marquesas were arranged by a regulation of 1930 in two administrative divisions (*circonscriptions*). The northern Marquesas comprised Nukuhiva, Uahuka, Uapou and neighbouring islands, with Taiohae as administrative centre; the southern Marquesas comprised Hivaoa, Fatuhiva, Tahuata, Mohotani and their neighbours, with Atuona as the centre. Each division had a medical man as Administrator, with the title of *Chef de Circonscription*; he received his instructions direct from the Governor of the colony. In 1935, however, the two administrative divisions were united, and the one seat of government is now at Atuona, on Hivaoa.

Education in the colony is comparatively undeveloped; there is a government school for girls, established at Atuona in 1924, but the few other primary schools in the group are maintained by the missionaries.

The system of land tenure was for a long time unsatisfactory. In 1863 the ancient communal rights of the people were abolished, and the actual cultivators of land were regarded as the owners. Also, all pigs found unmarked were designated as the property of the chiefs. In 1889 Native Commissions were set up to deliver proper titles, but in granting these the ancient owners of the land were often defrauded, since there was no public investigation of title, and the boundaries were often ill-defined. In 1913 a topographical survey was instituted to remedy this latter difficulty, but little was done till 1924. In 1902 regulations were introduced to prevent disposal of their lands by the native inhabitants without government authority—a

precaution necessitated by the extensive alienations that had taken place, mostly for small consideration.

ECONOMICS

There are no mineral resources in the Marquesas. Agriculture is the only economic activity. The amount of cultivable land is large, but little utilized. Coconuts, vanilla, cotton, sugar cane, taro, coffee, manioc and oranges and other fruits are grown. The principal export is copra, the average annual production in 1928 being estimated at about 1,800 tons. In that year about 10 tons of green vanilla and about 2 tons of coffee were also produced. (Later figures are not available.) The growing of cotton was instituted in 1865, and was formerly exported in some quantity, but since about 1914 the export has practically ceased. Production in agriculture could easily be increased by proper measures. Cattle, both domesticated and wild, are abundant on some of the islands, and several commercial companies have engaged in stock-raising at various times. Goats are also plentiful; they destroy much vegetation and tend to assist soil erosion.

There is little commerce in the Marquesas. There are two French trading firms, the Compagnie Navale de L'Océanie (which also set up a plantation about 1924 at the mouth of the Taipi valley in Nukuhiva) and the Compagnie Franco-Tahitienne; and one English firm, A. B. Donald, Ltd. They have trading posts at Atuona and Taiohae. There are also a few Chinese traders at Atuona. Most of the trade is with Tahiti.

COMMUNICATIONS

Communication before the present war was effected to some extent by vessels of the Messageries Maritimes, which called about once every two months en route from Papeete to Marseilles, and shipped copra. An irregular traffic is maintained between Papeete and the islands by auxiliary schooner. Within the island group much communication is carried by schooner and native canoe.

The land routes in each island consist of either horse-tracks or footpaths, often of a difficult nature and in bad condition. The rugged nature of the land surface makes travel arduous (Plate 58).

There is a W/T station at Atuona, with a subsidiary station at Taiohae. Postal facilities exist at Atuona and Taiohae, but there are no telegraphs or telephones.

HIVAOA

Hivaoa (lat. 9° 42′ s, long. 139° 00′ w at Hanaiapa) was called Dominica by Mendaña. In some respects it is the most important island of the Marquesas, since though not as large as Nukuhiva it has a greater population and in recent years has been the seat of the French administration. Its dimensions are variously given as 22 miles by 11 miles, and 25 miles by 8 miles in greatest length and breadth; its area is approximately 125 sq. miles.

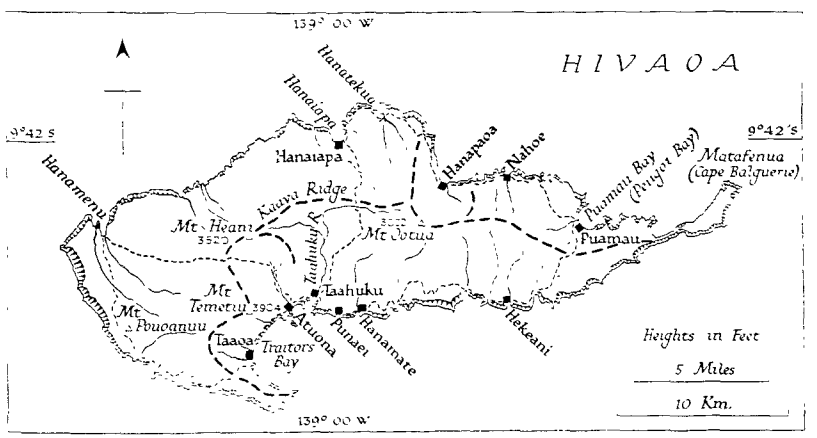


Fig. 74. Hivaoa

For general key to symbols see p. 8. Based on: (1) Admiralty chart no. 1640; (2) French Admiralty chart no. 3997; (3) A. M. Adamson, *Bernice P. Bishop Museum Bulletin*, no. 139, p. 44 (Honolulu, 1936).

Structure

The higher parts of the island are extremely rugged, deep gulches alternating with knife-edged ridges. The greatest elevation is reached at the summit of Temetiu, the height of which is officially given as 3,904 ft., though some authorities place it at well over 4,000 ft. Other important summits are Heani, 3,520 ft., and Ootua, 3,032 ft. The main backbone of the island is formed by a ridge running east and west, and then curving to the south-west, with subsidiary ridges separated by deep valleys running down from it (Fig. 74).

A little to the west of the centre of the island are three natural amphitheatres, apparently the eroded remains of volcanic craters, lying in a north-south line. One, Taaoa valley, with a floor below the sea, surrounds Vipihai (Traitors bay) on the south coast; another,

Atuona valley, with the floor slightly above sea level, surrounds the settlement of Atuona; the third, an arc formed by Kaava ridge, has a floor about 1,500 ft. above sea level and opens eastward on to the dissected central plateau. The valleys of Hanapaoa and Puamau on the north-east coast are also amphitheatres of similar type. The outer sides of the mountain range to the west of Atuona and Taaoa are fairly gradual slopes, dissected by numerous valleys, which widen out and leave rounded ridges between them. Farther down these ridges broaden into extensive plateaux, nearly level or inclined at a slight angle, and standing at elevations between 500 and 1,000 ft., with deep valleys separating them. The widest of these plateaux are at Tuohoa, Tupeka and Pahuta, to the east of Hanamenu. Along the south-west coast of the island is a high ridge, rising to nearly 2,500 ft. in Mt Pouoanuu, with steep slopes to the tops of the cliffs above the sea.

To the north-east of Atuona, from the head of the Taahuku valley to the head of the Hanaiapa valley on the north coast, is a dissected plateau about 1,300 ft. elevation, bounded on the north by Kaava ridge. The eastern portion of the mountain range is continuous from this plateau to the end of the narrow eastern peninsula at Cape Matafenua. The only outstanding peak is Ootua, which has a rounded top. On either side of the range flat summits of spurs constitute a plateau, 1,300–1,600 ft. above sea level, bracken-covered and deeply cut by stream valleys. The general trend of this surface is to the south.

The system of drainage on Hivaoa is fairly simple, most of the streams pursuing moderately straight courses to the sea. That of Taahuku, the longest, receives all the water from the southern side of Kaava ridge, from the west side of Ootua, and from much of the plateau north-east of Atuona. It has two main tributaries. One, with its source on the west side of Ootua, crosses the central plateau, disappearing in dry weather and reappearing farther west to enter the head of the Taahuku valley in a series of waterfalls. The other has excavated the very deep valley of Vaipae, in which there are waterfalls several hundred feet high. At the mouth of the Taahuku river, as at that of the Atuona stream, is a lagoon, formed by a rampart of sand and shingle above the beach. As a whole the streams, which have cut deep narrow gorges into the plateaux, descend steeply with many cataracts and waterfalls. Some, particularly those of Moevai, Vaipio and Vaitupo on the south coast, debouch above sea level in hanging valleys, and many of the tributary valleys are hanging also,

but in general their outlets are much embayed, with flat delta plains extending inland for a mile or so.

Coast

The coastline of Hivaoa is marked by extensive cliffs. In stretches on the south and south-west coasts they are 1,000 ft. or more in height, and along much of the north coast many of the spurs between the valleys end in headlands rising to over 500 ft. above the sea. The

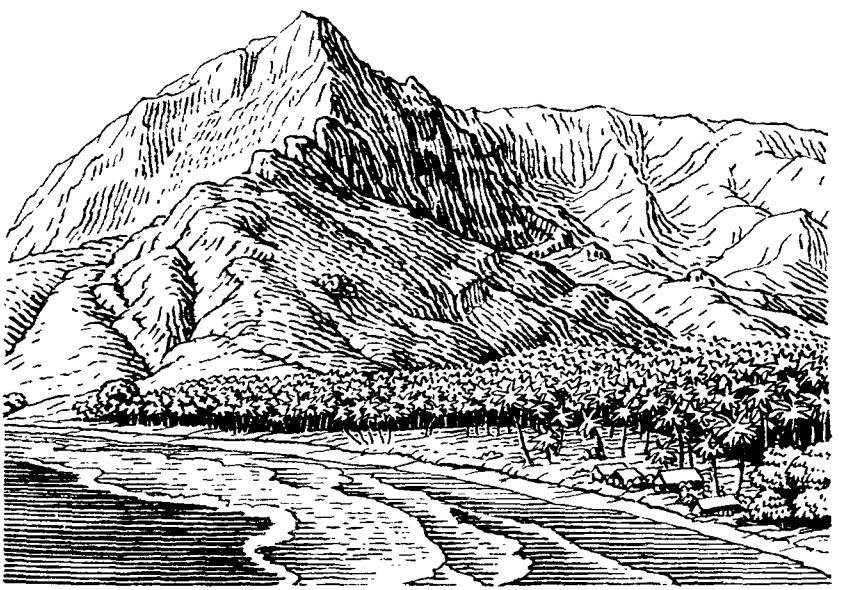


Fig. 75. Atuona bay and Temetiu, Hivaoa
Based on photographs. The main settlement is not shown.

eastern promontory is cliffed throughout. A raised shore shelf appears to be present all round the island. Anakee, near Atuona, is the only prominent islet round the coast, the others being merely small rocks. The coastline is indented by many deep bays, with beaches of black sand and shingle (Fig. 75).

Anchorages. The best anchorages are on the north side. Puamau (Perigot bay) lies to the north-east in a wooded amphitheatre of mountains with truncated summits rising to as much as 2,444 ft.; anchorage is on good ground from 10 to 12 fathoms, but landing is not easy because of surf. Food is scarce, and communication with

Atuona, 15–20 miles away is, as elsewhere on this coast, only by muddy trail over high mountains. Hanatekua, on the north, has anchorage in 6½ fathoms, and Hanaiapa, about 1½ miles to the west of it, has good anchorage from north-east winds in 10 fathoms. Landing here is difficult and water is not easy to obtain. Hanamenu, near the north-west point of the island, is a bay divided by a cliff of dark rock 735 ft. high; it was one of the most favoured watering places for sailing vessels in the Marquesas, but is open to the north. On the south side much of the coast is rugged and inaccessible. Traitors bay is an open bight, but Taahuku bay offers a well-sheltered anchorage for vessels of medium size; there is often a swell but the holding ground is good. This bay is the harbour for Atuona.

Settlement

Atuona is the largest settlement in the group, with about 350 inhabitants. It is the place of residence of the Administrator, and has a hospital, a W/T station, several Chinese stores and a European store; it is also the centre for the Roman Catholic mission in the islands. Good water can be obtained there in barrels.

The other principal villages on Hivaoa are Taaoa on the south coast and Hanaiapa and Puamau on the north. There are a few hamlets as well, mainly on the south coast, but the entire western region from Hanaiapa to Taaoa is uninhabited.

TAHUATA

(Fig. 76)

Tahuata, formerly known as Santa Cristina, lies to the south of Hivaoa. Its position (at Vaitahu) is given by the Admiralty *Pilot* as lat. 9° 56′ S, long. 139° 00′ W, but it appears somewhat to the westward of this on the chart.

The island is about 8 miles long by 4 miles wide at its broadest, and rises to a maximum altitude of 3,280 ft. at the summit of a knife-edged semicircular ridge which forms its major axis. On the concave south-east coast, and on the west coast, the slope from the top of the ridge to sea level is very steep, with high cliffs at the ends of buttress-like spurs which separate the short wide valleys. The northern slope is more gradual and is less deeply cut, by radiating valleys separated by rounded grass-clad spurs. The low rainfall and the porous nature of the rocks here keep these valleys comparatively dry; there are no

alluvial deltas where the streams emerge at the sea, but only flats of calcareous beach sand at the heads of the bays. Many tropical fruits

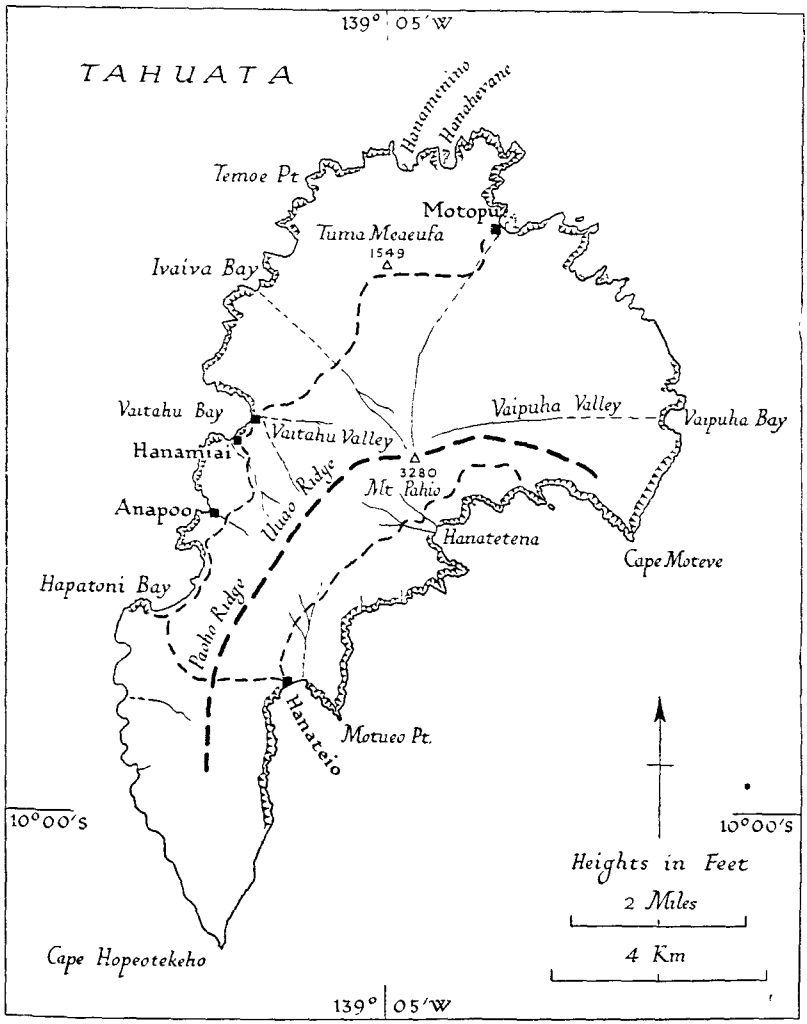


Fig. 76. Tahuata

Based on: (1) Admiralty chart no. 1640; (2) French Admiralty chart no. 3997; (3) A. M. Adamson, *Bernice P. Bishop Museum Bulletin*, no. 139, p. 49 and plate 7 (Honolulu, 1936).

such as bananas and breadfruit will not grow on these flats, and the natives depend for their water supply on springs between the tide marks or just above sea level.

There are only three practicable anchorages, all on the west side but none are good. Vaitahu, formerly known as Resolution bay, was the first port occupied by the French in 1842, but was afterwards

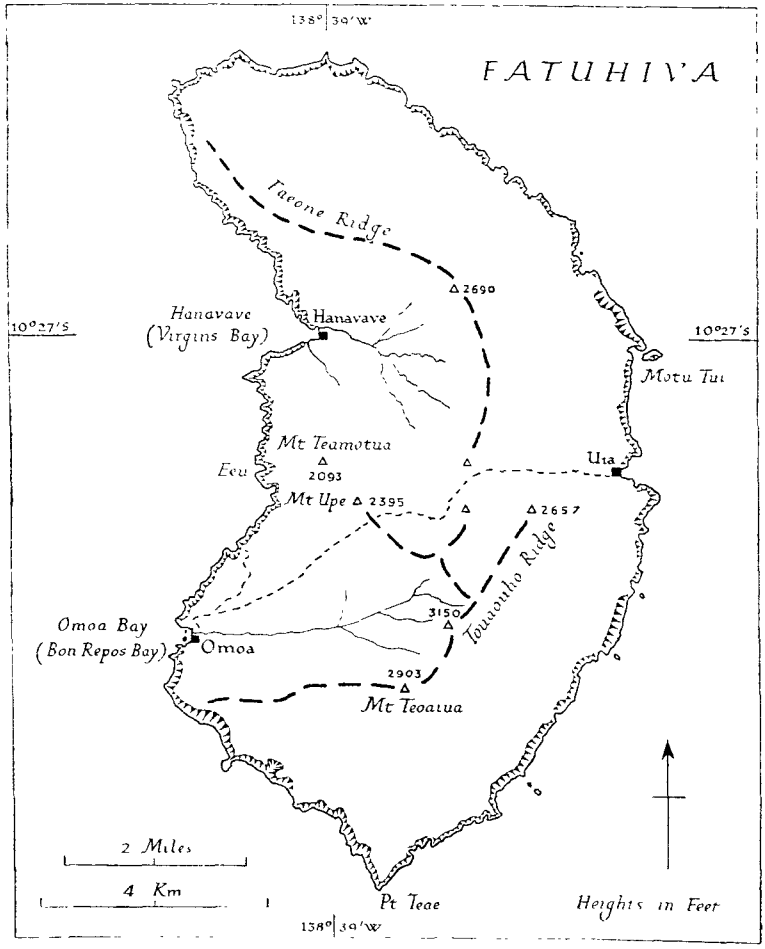


Fig. 77. Fatuhiva

Based on: (1) French Admiralty chart 3962; (2) A. M. Adamson, *Bernice P. Bishop Museum Bulletin*, no. 139, p. 51 (Honolulu, 1936).

abandoned by them. It is not safe in westerly winds, but is usually calm. Water is available from one of four cisterns on the beach. Hapatoni is a poor anchorage, seldom used. There is also an anchorage in Ivaiva bay, to the north of Vaitahu, in 8 fathoms, and copra is sometimes shipped from there.

The island formerly supported a large population, but there were only 253 inhabitants in 1931, distributed among five villages.

FATUHIVA

(Fig. 77)

Fatuhiva, called Magdalena by Mendaña, is the southernmost island of the group (lat. 10° 27′ S, long. 138° 39′ W at Hanavave). It is about 8 miles long and 4 miles wide and rises to a maximum height of 3,150 ft. in Mt Tauauoho (Touaouho). The coastline is very rugged.

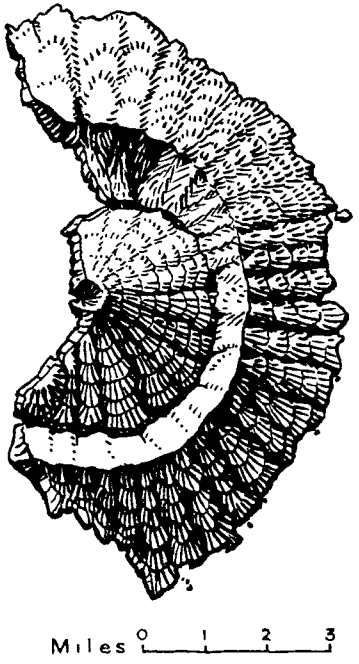


Fig. 78. Fatuhiva: simplified relief sketch

Based on L. J. Chubb, *Bernice P. Bishop Museum Bulletin*, no. 68, p. 7 (Honolulu, 1930).

The island is crescentic in plan (Fig. 78) and appears to consist essentially of an outer volcanic cone within which a new cone has been built up; the western half of the whole structure has disappeared owing to faulting. The outer crater wall is a serrated razor-backed ridge of semicircular form (Fig. 79). On the outer (eastern) side a long volcanic slope extends from the crest to sea level with comparatively

low cliffs at its foot, though at the north-west and south-west ends the cliffs are high and perpendicular. The inner (westward) side is precipitous, with steep cliffs supported by buttresses and short spurs. The inner volcanic cone, separated from the outer by a deep moat-like depression, is a semi-conical hill about 2,500 ft. high. The moat is occupied by two streams flowing respectively north and south and curving round to the west to reach the sea in Hanavave and Omoa bays. Omoa river is the largest in the island and one of the largest in the Marquesas. The western side of the remnant of the inner cone faces the sea in a line of high cliffs furrowed by small gullies. Conspicuous among these in the centre is a funnel-shaped valley into which the sea has been admitted, forming Eeu bay; this occupies the ancient crater. The general form of the island has been much modified by erosion (Fig. 80).



Fig. 79. Fatuhiva: profile from the west

Based on L. J. Chubb, *Bernice P. Bishop Museum Bulletin*, no. 68, p. 9 (Honolulu 1930).

Fatuhiva is the wettest island in the group, and the cloud zone descends farther than on the other islands. But the cloud cap which forms over the mountains overlays the upper reaches of Omoa and Hanavave valleys, and there is more precipitation on the westward lee side of the range than on the eastern windward side. Omoa and Hanavave consequently have a luxuriant vegetation, with plants which are ordinarily confined to the mountains growing low down, and with mosses and ferns growing even on the face of the cliffs. Vegetation on the eastern side, however, is meagre in comparison, and deforestation has been aided by the ravages of goats.

On the east, north and south sides no landing is practicable. Two anchorages are on the west side, but are subject to violent squalls. Hanavave (Virgins bay) is the better, with easier landing. Omoa bay (Bon Repos) has a heavy swell. The Spaniards landed at Omoa in 1595, and both bays were afterwards used a great deal by whaling vessels. Water can be obtained in each bay, though not with ease, and fruit is available at the village which is near each landing. Hanavave especially is noted for its oranges.

The population of the island was 181 in 1931, the main settlements being Omoa and Hanavave, with a small hamlet also at Uia, on the

east coast, to which a trail leads from Omoa. Fatuhiva was the last island of the Marquesas to pass completely under French control, and till recently, at least, more of the old forms of life were to be found there. About 1920, bark cloth was still made there regularly, and the best carvers and tattoo artists were to be found there.

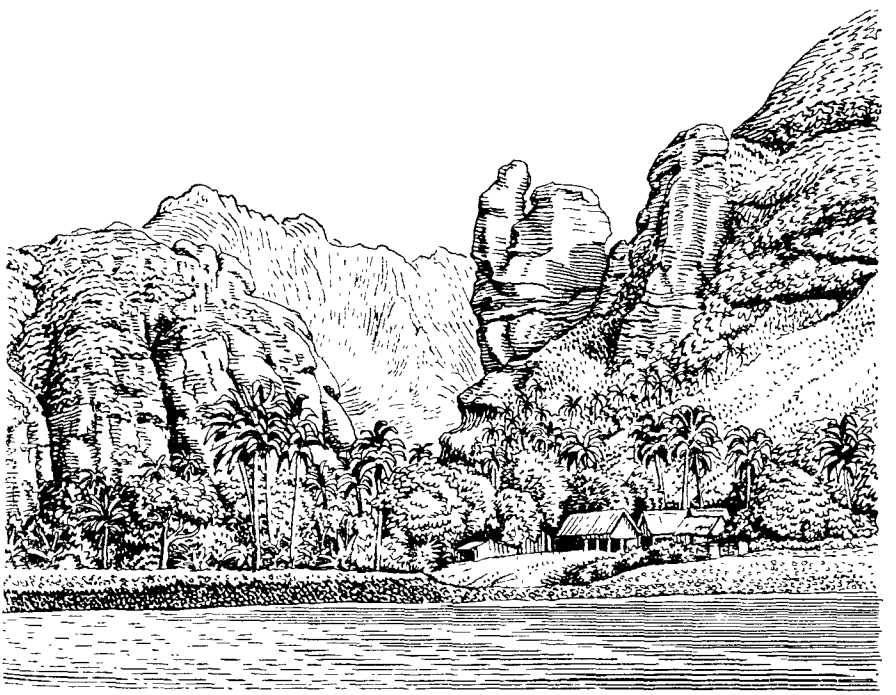


Fig. 80. Hanavave, Fatuhiva

Showing the narrow delta plain, the pinnacles carved out of the consolidated ash of the inner cone, and the inner face of the caldera wall. Based on a photograph by the *St George* expedition, 1924–5; reproduced also by L. J. Chubb, *Bernice P. Bishop Museum Bulletin*, no. 68, plate IA (Honolulu, 1930).

MOHOTANI (MOTANE)

(Figs. 81, 91)

About 5 miles long and 1½ miles wide, this island lies about 10 miles south of Hivaoa, and was formerly named San Pedro. Its greatest elevation is 1,640 ft., at a point near the south-east side, whence it slopes gently to the west and north, with a surface broken only by a few shallow valleys. The south end is a plateau, bounded on three

sides by cliffs from 1,000 to 1,500 ft. in height, and these cliffs extend along the eastern side of the island, gradually diminishing in elevation as they approach the northern end. At Anafai on the north-west a sandy beach is exposed at low tide; elsewhere the shores are rocky.

The climate is dry. A tiny stream near the north-western end of the southern plateau disappears underground in dry weather before reaching the sea, and the northern region is devoid of permanent streams. Two permanent springs are known, one on the western shore at Anauia and the other at an altitude of 650 ft. at the top of the precipice above it.

The central portion of the island is well forested, with large *Pisonia* trees, numerous *Cordia* and *Thespesia*, and scattered pandanus and hibiscus. A tall grass is dominant over most of the southern part, and the northern region was formerly covered by a sparse vegetation, but has been reduced to a barren waste of red stony soil by the sheep to which the island has been abandoned. In many parts of the



Fig. 81. Mohotani: profile from south-west

Based on L. J. Chubb, *Bernice P. Bishop Museum Bulletin*, no. 68, p. 10 (Honolulu, 1930).

forested zone also sheep have destroyed much of the undergrowth, with consequent soil erosion. Some coconut palms, sugar cane and breadfruit trees mark former cultivation.

Anchorage is safe in Puhioono bay to the west of the north point, in the trade winds, and landing may be made at several points on the west coast.

Mohotani was formerly inhabited by a single tribe of people, but now has no permanent inhabitants, though labourers of the Compagnie Coloniale de l'Océanie, to which a concession was granted in 1927, visit it at times to work a coconut plantation near Ataeva bay.

FATUUKU

Fatuuku (lat. 9° 26′ S, long. 138° 55′ W), named Hood island by Cook in 1774, lies about 15 miles north of Hivaoa. It is only about 1½ miles long and ½ mile wide, with an area of about ½ sq. mile. The summit, 1,180 ft. in elevation, is flat, with an area of about 30 acres, and is

bounded on all sides by steep slopes or vertical cliffs above the sea. The ascent to the summit is distinctly dangerous.

The coastline is everywhere rocky. A raised beach shelf is present in some parts, and from it the cliffs rise nearly vertically all around the island.

The climate is dry, but at an altitude of about 600 or 700 ft. there is a tiny spring, which is said to be permanent. Most of the surface of the island is bare rock, more or less decomposed, with here and there a scanty growth of grass, shrubs and herbs; a growth of *Pisonia* trees exists on the southern part of the flat top.

The island is not easy of access, but there is a landing place in favourable weather on the north-west side, where the cliffs are lowest, and on the trail leading from it there are steps cut by Marquesans in former times.

It seems certain that Fatuuku has never been inhabited, though it was formerly visited frequently by fishermen and bird hunters from Hivaoa. It is a nesting place for large numbers of frigate birds, boobies and terns.

NUKUHIVA

Nukuhiva (lat. 8° 56′ s, long. 140° 00′ w at the south-east point) was called Baux island by Marchand in 1791; it lies about 70 miles north of Hivaoa, and is the principal island in the northern Marquesas. It is nearly 20 miles long by about 12 miles broad, and has an area of about 130 sq. miles (according to some accounts 186 sq. miles), being the largest of the Marquesas. The highest point is given on the Admiralty chart as 3,890 ft. above sea level, but possibly another peak than that shown on the chart may reach about 4,000 ft. in height (Fig. 82).

Structure

Nukuhiva is roughly quadrilateral in shape, but in structure appears to be essentially identical with Fatuhiva, consisting of an outer cone within which a new volcano has been built up; the southern side of both outer and inner cones has disappeared owing to faulting (Fig. 83).

The mountain ranges of the island are peripheral, surrounding a central depression known as Tovii. Most of the eastern and middle region of the depression is undulating country, traversed by low, rounded ridges and fairly shallow valleys; its average altitude here

is between 2,500 and 2,800 ft. The western portion is a remarkably flat plain, about 2,700–2,800 ft. above sea level, with the main stream flowing slowly along it in a bed of gravel and sand only a few feet below the general level.

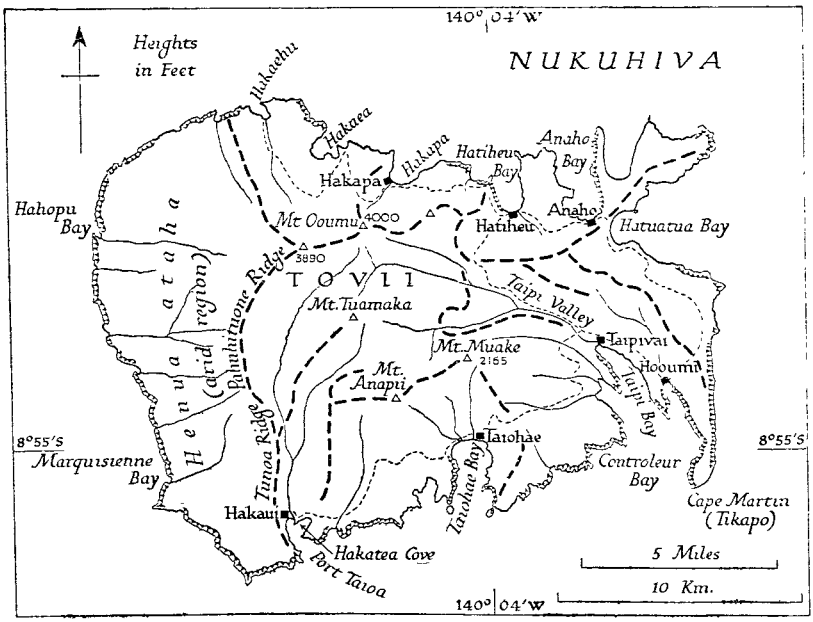


Fig. 82. Nukuhiva

Based on: (1) Admiralty chart no. 1640; (2) French Admiralty chart no. 3931; (3) A. M. Adamson, *Bernice P. Bishop Museum Bulletin*, no. 139, p. 56 and plate 8 (Honolulu, 1936).



Fig. 83. Nukuhiva: profile from the south

Note the general resemblance to Fig. 79. Based on L. J. Chubb, *Bernice P. Bishop Museum Bulletin*, no. 68, p. 19 (Honolulu, 1930).

From the edges of the depression radiate several mountain ridges, of which the most striking is the Pahuhituone-Tunoa ridge, running along the western side to the south, and emerging to form the western side of Hakaui valley and bay in an imposing line of buttressed cliffs about 3,000 ft. above the sea. In contrast to the steep inner eastern slopes of this ridge are the long outer western slopes of lava flow, which, like the similar slopes on Hivaoa, constitute a dry region, the

henua ataha or so-called 'desert'. A second great ridge runs east from the central depression and bounds the Taipi valley on the east side. To the north and to the south of the depression the mountains are less regular and are very rugged, especially in the northern group, with several peaks of nearly 4,000 ft. elevation.

The two principal valleys of Nukuhiva are Hakaui and Taipi, both being very long and much eroded. The former is a narrow canyon with an almost flat floor for about 1½ miles inland; the latter, famous as the scene of Hermann Melville's *Typee*, has also a flat floor and is

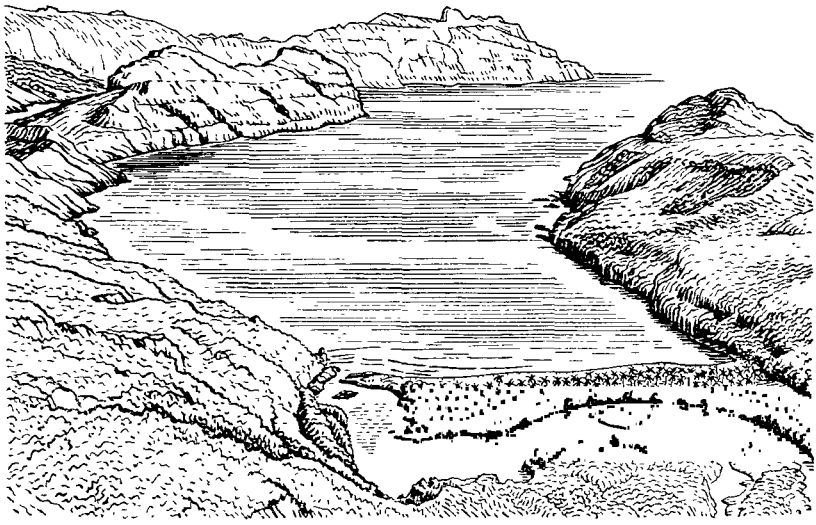


Fig. 84. Mouth of the Taipi valley, Nukuhiva

The inlet is an arm of Controleur bay. Based on a photograph in F. H. B. Brown, *Bernice P. Bishop Museum Bulletin*, no. 84, plate 34 A (Honolulu, 1931).

much broader. Most of the other valleys are short and wide, some on the north coast, as also Taiohae on the south, being of amphitheatre type. On the western slope the smaller valleys are V-shaped ravines.

The island is on the whole well watered, though the western region has a rather sparse rainfall and the streams there are subject to desiccation. The two largest rivers, those of Hakaui and Taipi, rise in the central depression and flow out to the south coast; as in many cases in the Marquesas, they have deltaic plains at the mouth and beaches at the head of their bays acting as dams and leading to the formation of swampy pools or fresh-water lagoons (Fig. 84).

Coast and Anchorages

The coastline of Nukuhiva is deeply embayed everywhere except on the west, and shows a succession of precipitous high cliffs, rising in many places to over 500 ft. at the headlands.

The south side offers the best anchorages, there being three excellent bays where ships may lie in safety for much of the year. Controleur (Comptroller) bay affords good shelter from prevailing northerly winds from October to April, and is divided into three coves, in which the swell is avoided, with anchorage varying from 9 to 17 fathoms. Water of good quality may be obtained from the stream. Taiohae (Anna Maria) bay, where Porter established his vessels in 1813, offers best shelter from north-easterly winds, with anchorage in 10 or 11 fathoms on the east side. But it is fairly open, with a heavy swell from April to September, and there is danger of dragging then. Taioa bay in the south-west is small, but gives good anchorage in 7 fathoms, and Hakatea cove in the north-east part is a fine basin completely landlocked.

On the north side Hakaehu, a small basin, offers good anchorage from north-west winds; Hatiheu bay has a poor anchorage; Anaho bay is a small anchorage formerly much used by whalers, but practically untenable in northerly winds. The west side of the island, being little indented, offers no good anchorage, while on the east coast there is no anchorage at all, the large bay of Haatuatua (Hatuatua) being fully exposed.

Settlement and Communications

The population of Nukuhiva was 543 in 1926—a marked contrast to the many thousands recorded by Porter and by Hermann Melville.

The population is at present mainly distributed among the settlements of Hakaui, Taiohae, Taipivai and Hooumi on the south, and Hatiheu and Hakapa on the north. There was probably never any permanent settlement in the central area; a small Czechoslovakian colony began to establish plantations of coconuts, bananas and coffee at 'Praha' in central Tovii, but the project was abandoned in 1931.

The principal settlement, Taiohae, is the main centre for the northern Marquesas (Fig. 85). Here the majority of the New Bedford whaling vessels anchored, and here the French established their principal military post when they first took control of the group. The headquarters of the government for the group were at Taiohae until 1904, when they were removed to Atuona. The population in 1931 numbered just over 200 (Plate 59).

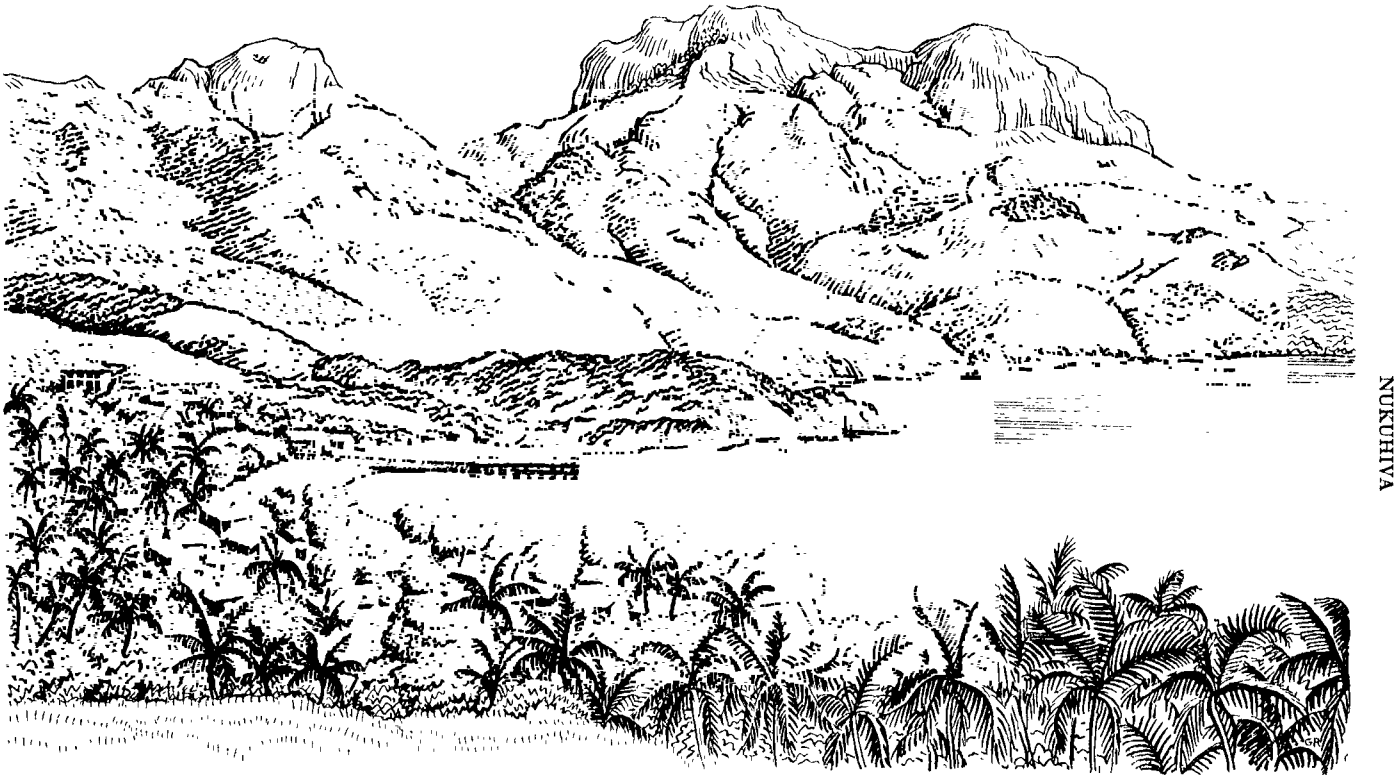


Fig. 85. Taiohae, Nukuhiva

Based on photographs.

Taiohae is a port of call for the Messageries Maritimes vessels, at infrequent intervals, on the journey between Papeete and Panama; a schooner from Papeete also calls at intervals of about two months. Beef and other stores are available there, and water (non-potable) is laid on at the pier.

There is a W/T station at Taiohae.

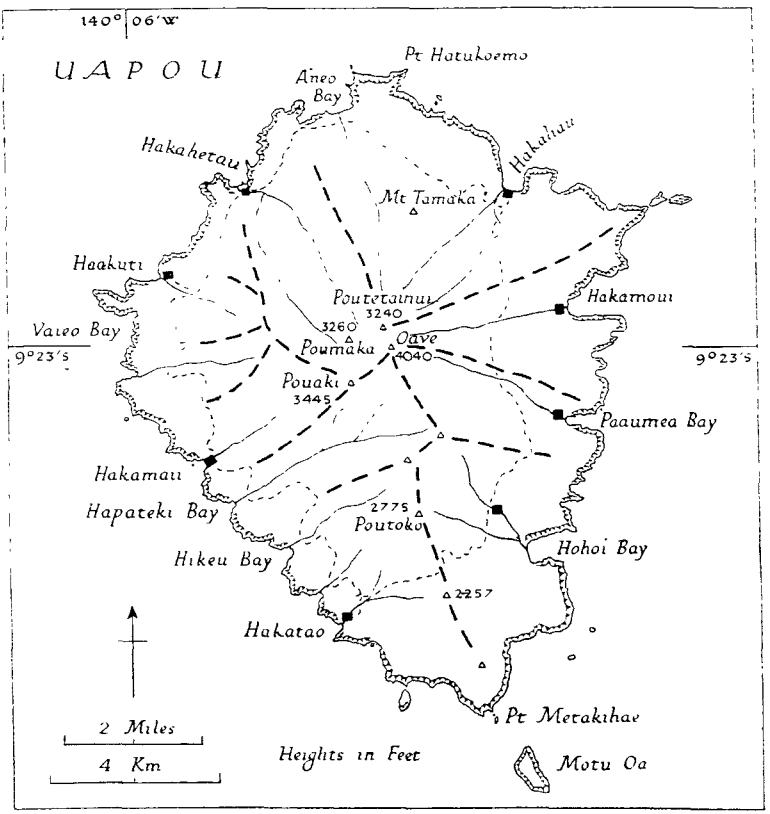


Fig. 86. Uapou

Based on: (1) French Admiralty chart no. 3935; (2) A. M. Adamson, *Bernice P. Bishop Museum Bulletin*, no. 139, p. 61 (Honolulu, 1936).

UAPOU

Uapou (lat. 9° 23′ s, long. 140° 06′ w at Vaieo), also called Marchand or Adams island, lies 23 miles south of Nukuhiva. It is about 9 miles long with a greatest width of about 7 miles, rising to an elevation of

4,040 ft. in a peak known as Poutetainui on the charts, but which is probably that of Oave, a steep-pointed cone nearly vertical on its northern side (Fig. 86).

The island is bold, rocky and picturesque. A central ridge traverses it from north to south, with a number of secondary ridges, the higher crests being knife-edged, with precipitous slopes into the valleys between. Above the crests of the ridges rise a series of about a dozen pinnacles, among them being Poumaka, with vertical sides nearly 2,000 ft. high and a summit 3,260 ft. above sea level (Fig. 87).

The largest valleys are on the eastern side, that of Hakahau being the widest, with a level area extending for a considerable distance

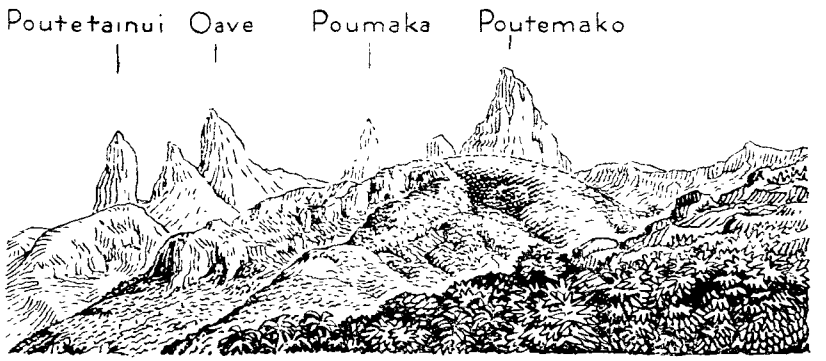


Fig. 87. Pinnacles on Uapou

As seen from near Hakahetau village, north-west coast. Based on a photograph by G. Le Bronnec, in A. M. Adamson, *Bernice P. Bishop Museum Bulletin*, no. 139, plate 3 B (Honolulu, 1936).

inland and surrounded by gentle slopes; the numerous valleys on the western side are comparatively narrow. The drainage system of Uapou is fairly simple, all the streams pursuing nearly straight courses to the sea.

The soil of Uapou is whitish, in contrast to the red soil of most of the other islands, and apparently is not very fertile. This, in conjunction with the low rainfall, gives much of the vegetation a scrubby character, less luxuriant than that of Hivaoa, Nukuhiva and Fatuhiva. The large valleys of the eastern side are well wooded, as also the upper parts of the ridges near the centre of the island, but the north-eastern corner is largely denuded of vegetation, owing partly to the presence of herds of wild asses.

The coastline of Uapou is greatly indented, many of the valleys

being drowned at their mouths. The shore is rocky, with cliffs or steep slopes above it, but the great vertical walls characteristic of the other islands are not present, most of the cliffs seeming to be not more than 200 or 300 ft. high. The beaches at the mouths of the valleys are black sand or shingle.

The best anchorage is on the west coast, where Vaieo affords perfect shelter from east winds, though it is exposed to winds from north-west through west to south. Anchorage is in 11 fathoms, on sand or gravel. Hakahetau, on the north-west coast, is good during

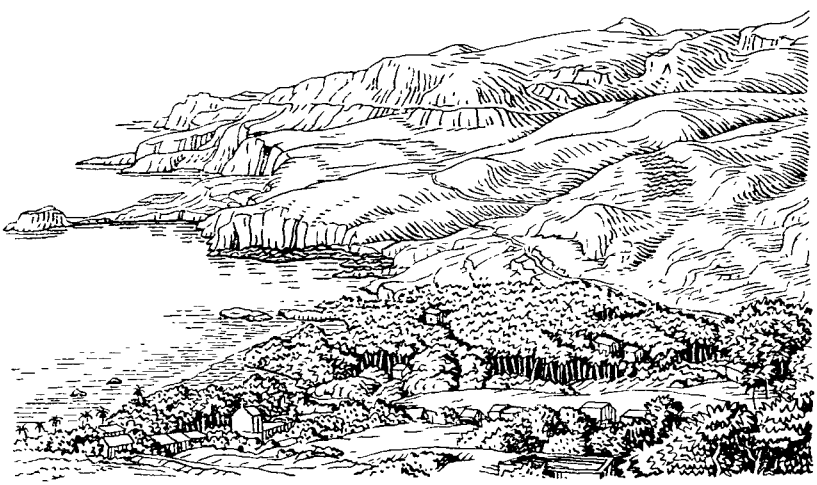


Fig. 88. Coast and village at mouth of Hakahetau valley, Uapou
Based on a photograph by G. Le Bronnec, in A. M. Adamson, *Bernice P. Bishop Museum Bulletin*, no. 139, plate 3 C (Honolulu, 1936).

the south-east winds from May to October, and fruit, fowls and fish can be obtained there in small quantities. Anchorage is in $5\frac{1}{2}$ to 14 fathoms. Aneo, on the north coast, is indifferent, with a swell. Temporary anchorage may also be found in Hakamaii, Hapateki and Hikeu bight, along the south-west coast, and moderate anchorages in Hakatao near the south point. The east side of the island is too exposed for anchorage.

The population of the island was given as 322 in 1926, but was estimated at about 380 in 1931. The principal villages are at Hakahetau (Fig. 88) and Hakahau, each with about 100 inhabitants.

UAHUKA

Uahuka (lat. 8° 55′ s, long. 139° 32′ w at Hane), called at various times Ile du Solide and Washington island, lies 23 miles to the east of Nukuhiva. It is about 9 miles long and 5 miles wide in greatest measurement, and of a roughly crescentic shape (Fig. 89).

A semicircular central ridge forms the backbone of the island, with steep but fairly uniform slopes cut by numerous small valleys to the north, and abrupt slopes to the south, leading into several long valleys. The range rises gradually from about 1,800 ft. at the western end to

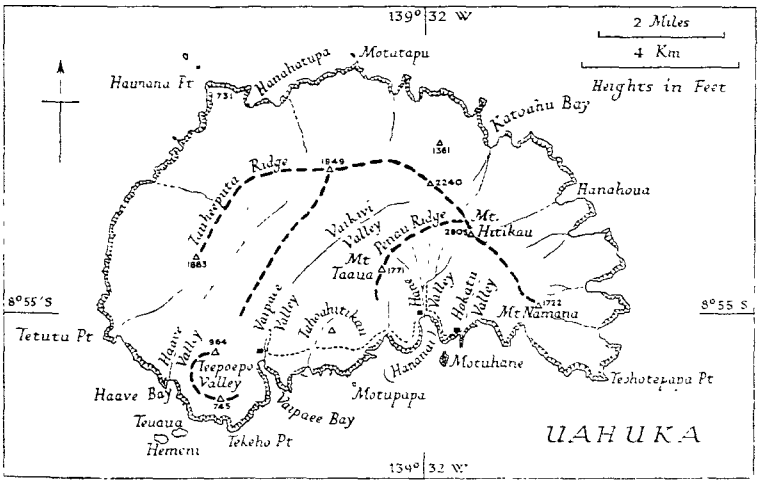


Fig. 89. Uahuka

Based on: (1) French Admiralty chart no. 3930; (2) U.S.H.O. chart no. 179; (3) A. M. Adamson, *Bernice P. Bishop Museum Bulletin*, no. 139, p. 64 (Honolulu, 1936).

a highest point of 2,805 ft. at the eastern end. The original structure of the island was probably similar to that of Fatuhiva and Tahuata, the semicircular crest of the central ridge having been the rim of the northern half of a volcanic crater.

The principal valleys are Hane and Hokatu, both short and wide, of amphitheatre type, and Vaipaee and Haave, both long, narrow and deeply eroded. The major streams are on the southern side of the main range, in these valleys. On the north side of the main range the streams are short, and only two of them are said to be permanent.

Because of its low altitude, Uahuka probably receives less rain than any of the other inhabited islands, and the mountain flora is less rich.

On the south coast the valleys of Hane and Hokatu are well wooded, but to the west the forest is meagre, and most of the south-west region has only a very scanty covering of vegetation. This is the 'desert' area.

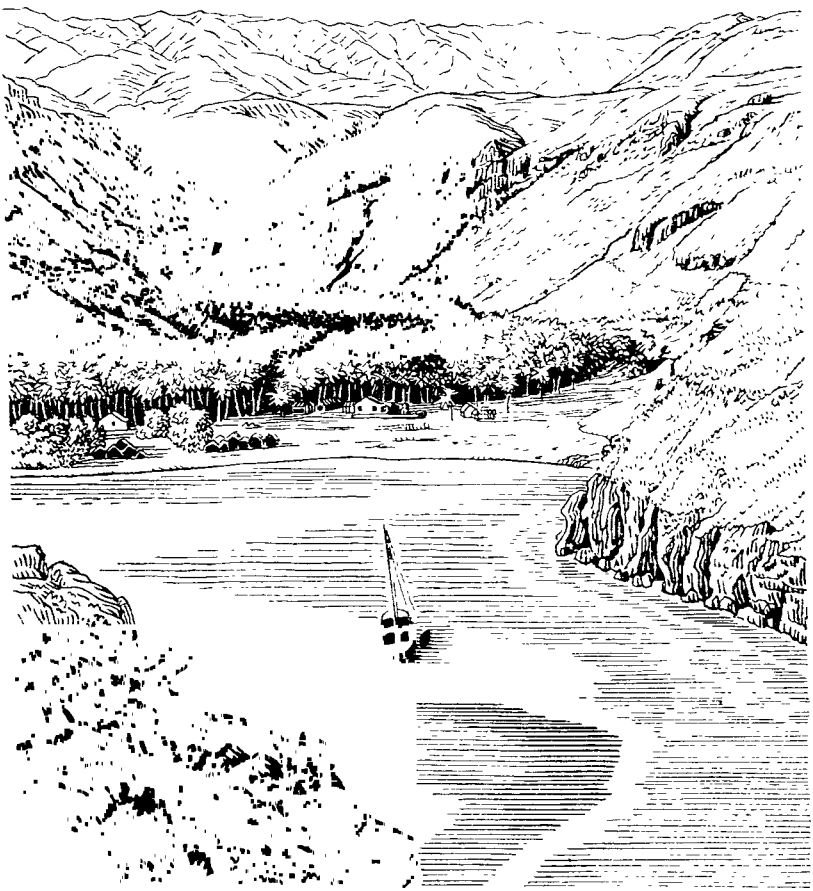


Fig. 90. Vaipaee, south coast of Uahuka

Based on a photograph.

The coast is barren and forbidding, with cliffs almost everywhere except at the mouths of the valleys. Though the coastline is well indented there is one good anchorage only, that of Haave (which has been variously called Ha'avei, Chave, Shavay and Shaveh), in 11–16 fathoms, immediately to the north of the two islets Hemeni

and Teuaua, at the south-west corner of the island. Hemeni, composed of reddish rock, is surrounded by vertical cliffs, while Teuaua is a low flat-topped island of whitish rock, the nesting place of an immense colony of sooty terns. Two other anchorages on the south side of Uahuka, Vaipaee (Fig. 90) and Hane, are difficult.

The population of Uahuka has probably always been small; it was 139 in 1926, and 126 in 1931. The villages are all on the south coast, at Vaipaee, Hane and Hokatu. Much of the present population is drawn from other islands.

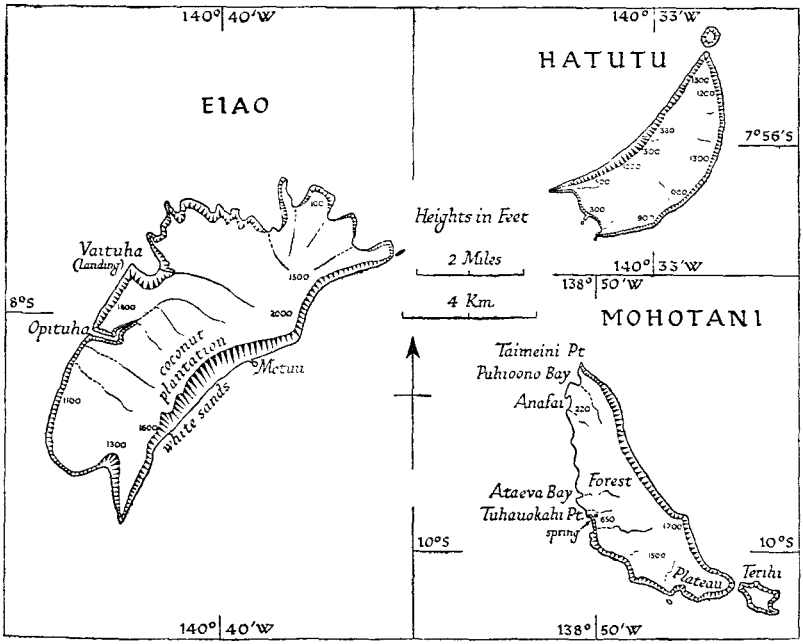


Fig. 91. Minor islands of the Marquesas

Sketch plans; scale and details approximate. Based on: (1) French Admiralty chart no. 3997 (Mohotani); (2) A. M. Adamson, *Bernice P. Bishop Museum Bulletin*, no. 139, pp. 54, 66, 69 (Honolulu, 1936).

EIAO

Eiao, formerly called Masse island, lies about 53 miles north-west of Nukuhiva. It is slightly arcuate in form, about 8 miles long by 4 miles wide in greatest measurement, with an area of about 20 sq. miles. Its maximum altitude is about 2,000 ft. (Fig. 91).

The south-eastern side, which is slightly concave, is an uninterrupted precipitous slope more than 1,500 ft. high for most of its

length and reaching 2,000 ft. towards the northern end. From this south-eastern side the land slopes gently down in a plateau to slightly lower cliffs on the west and north. The general surface of the plateau is fairly flat, broken by shallow depressions into a series of low rolling hills.

Almost all the drainage is towards the west of the island. The only permanent stream, the water of which has a brackish taste, drains the highest part of the plateau, entering the valley of Vaituha in a series of cascades. Elsewhere the streams are intermittent, but the coastline is deeply embayed at their mouths. Opituha valley, the stream of which drains a large part of the plateau, is a narrow sinuous canyon.

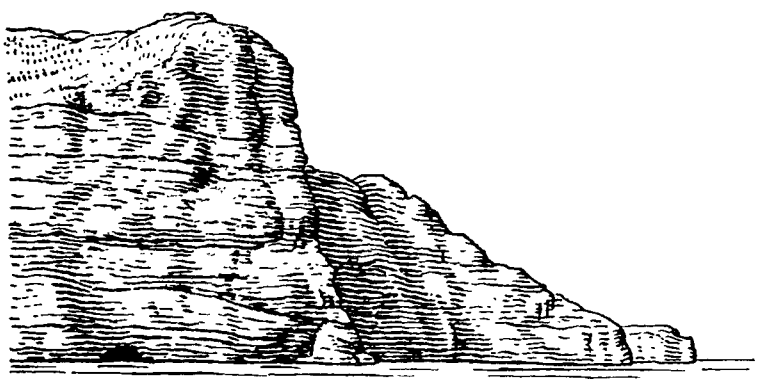


Fig. 92. Cliffs near south-west end of Eiao

Based on a photograph in A. M. Adamson, *Bernice P. Bishop Museum Bulletin*, no. 139, plate 4 B (Honolulu, 1936).

The island is too low to cause much precipitation from the trade winds, and in times of drought much of the surface is bare, though a rainy period converts much of the plateau into green prairies. Many thousands of sheep and pigs, together with other grazing animals, to which the island was abandoned about fifty years ago, have denuded the vegetation, and rapid erosion of the surface soil has taken place in parts.

The coastline is forbidding, especially on the east and south, with its high unbroken cliffs (Fig. 92). At the foot of the eastern slopes, however, is a long, narrow stretch of white sand, one of the few sandy beaches in the Marquesas that are not situated at the mouths of valleys. There are small beaches of sand or shingle at the heads of the

bays on the northern side of the island. A raised coastal shelf is well developed along the western side, reaching in one part an estimated height of about 15 ft.

The sole anchorage is at Vaituha, on the north-west, but landing may be made at the north and south ends of the island, as well as on the sandy beach on the east side.

It is uncertain whether Eiao bore a permanent population in pre-European times, though it was certainly visited frequently and house platforms have been found. Rock from the island was most preferred for adze blades throughout the Marquesas; most of the blades were apparently exported in a rough condition and ground elsewhere. Eiao was used as a convict settlement until about 1870. In 1927 a concession for the export of cattle was granted to a commercial firm, and between then and 1929 a party of Tahitian labourers planted coconuts near the middle of the island and around the settlement at Vaituha.

HATUTU

(Fig. 91)

Hatutu (formerly sometimes called Chanal island) is separated from Eiao by a channel about 2 miles wide. It is the most northerly substantial island of the Marquesas group. Its dimensions are variously given, but a recent investigation assigns it a length of 5 miles, a greatest width of 2 miles and an area of about 7 sq. miles. Its greatest elevation is 1,380 ft.

The island is roughly crescentic in plan, with the convex side to the east, falling in a precipitous slope about 1,000 ft. to the sea. The concave western side is formed by nearly vertical cliffs a few hundred feet high. The interior of the island forms a fairly steep slope inclined from east to west, and cut very slightly by valleys, the largest of which emerges at sea level on the southern side.

The climate is arid, no permanent streams or even springs being known. The dominant vegetation is a tussock grass, with large thickets of shrubs and a few trees of *Pisonia* along the top of the island and here and there on the cliffs.

The coastline is simple, with rocky cliffs everywhere except for a small beach of sand in a bay at the southern end. Along the western coast is a low beach shelf. Near the northern end is a conical islet with a sharply pointed summit, and off the southern end are two flat

islets, one of which is a nesting place for sooty terns. The island as a whole, especially on the western slopes, is a nesting place for frigate birds, boobies and other sea fowl.

No anchorages are known round Hatutu, though landing may be made at the southern end, and at the mouth of a small valley near the middle of the western side.

It is doubtful if the island was ever permanently inhabited, though it was used as a temporary residence by fishing parties. At the present time it is rarely visited.

'CORAL' ISLETS

About 10 miles east-north-east of Hatutu are one or two low islets, about which very little is known. Referred to variously as 'Coral islands', 'Iles de Corail', 'Iles de Sable', or (on the U.S. Hydrographic Office chart) as 'Cotar Island', this appears to be not a true coral formation but probably a bank of sand or loose volcanic material piled up by the prevailing westerly current on the submerged ridge on which Eiao and Hatutu stand.

The islet has recently been described as consisting of a stretch of white sand, more than a kilometre in length, and partially covered in low shrubs and tussock grass, in which great numbers of sea birds were nesting. There is apparently also a shallow lagoon, with no pass into it.

MOTU ITI

Motu Iti (Hergest rock) lies 27 miles west-north-west of Nukuhiva, and comprises three islets, the largest of which, the westernmost, is a rock about 720 ft. high, with precipitous sides. There is no landing place on the largest islet, but landing is possible on the smaller ones. They are waterless and practically devoid of vegetation, and have never been inhabited.

BIBLIOGRAPHICAL NOTE

The best general account of the Marquesas is given by L. Rollin, *Les Iles Marquises* (Paris, 1929). This work is by a medical man who was an Administrator of the islands.

Aspects of the physical geography are dealt with by L. J. Chubb, 'Geology of the Marquesas', *Bernice P. Bishop Bulletin*, no. 68 (Honolulu, 1930); and by A. M. Adamson, 'Review of the Fauna of the Marquesas Islands and Discussion of its Origin', *Bernice P. Bishop Museum Bulletin*, no. 159 (Honolulu, 1939), and 'Marquesan Insects: Environment', *Bernice P. Bishop Museum Bulletin*, no. 139 (Honolulu, 1936). The last-named work gives much detail about the interior of the islands,

drawn largely from observation by Le Bronnec, a local resident. A technical account of the coast is given by C. Crossland, 'The Expedition to the South Pacific of the S.Y. *St George*. Marine Ecology and Coral Formations in the Panama Region, the Galapagos and the Marquesas Islands and the Atoll of Napuka', *Transactions of the Royal Society of Edinburgh*, vol. LV, pp. 531–54 (Edinburgh, 1927).

The anthropology of the region is covered fully in a series of publications of the Bernice P. Bishop Museum of Honolulu, the principal works being: E. S. C. Handy, 'The Native Culture in the Marquesas', *Bulletin*, no. 9 (1923); R. Linton, 'Archaeology of the Marquesas Islands', *Bulletin*, no. 23 (1925); R. Linton, 'The Material Culture of the Marquesas', *Memoir*, vol. VIII, no. 5 (1923); L. Sullivan, 'Marquesan Somatology with comparative notes on Samoa and Tonga', *Memoir*, vol. IX, no. 2 (1923). The art of the people is discussed, with many illustrations, by K. von den Steinen, *Die Marquesaner und Ihre Kunst*: I, *Tatauierung* (Berlin, 1925); II, *Plastik* (Berlin, 1928).

Accounts of the Marquesans in the early years of European contact are given by C. A. Vincendon-Dumoulin et C. Desgraz, *Iles Marquises ou Nouka-Hiva* (Paris, 1843) and (from the missionary point of view) by Le Père Mathias G..., *Lettres sur les Iles Marquises* (Paris, 1843) and P. S. Delmas, *La Religion ou Le Paganisme des Marquisiens* (Paris, 1927). The description by Hermann Melville in *Typee* (first published in 1846 and since available in several cheap editions) gives a very good impression of the native life in the early period. A brief description of modern conditions is given by A. J. A. Douglas and P. H. Johnson, *The South Seas of Today* (London, 1926).

For maps see Appendix I.

Chapter VIII

GENERAL REVIEW OF THE HAWAIIAN GROUP

Physical Geography: History: Growth and Distribution of Population: Peoples: Administration and Social Services

The Territory of Hawaii, annexed in 1898, is now considered an integral part of the United States of America, though legally it is not a state of the Union. It comprises five large and three small volcanic islands (lying between lat. 19° and 22° 15′ N, long. 155° and

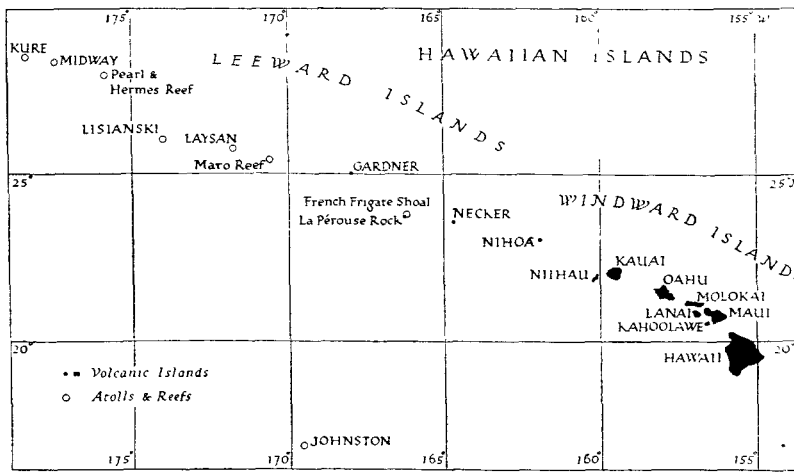


Fig. 93. The Hawaiian islands
Based on U.S. Coast and Geodetic Survey chart no. 4000.

160° 15′ W) and a long chain of volcanic rocks and coral atolls stretching in a westerly direction from Kaula, the most westerly of the windward group, to Kure (Ocean) island (lat. 28° 25′ N, long. 178° 25′ W) (Fig. 93).

The territory is often divided geographically into two groups, the eight major inhabited islands to the east being known as the Hawaiian windward islands, and the other small almost uninhabited islands to the west as the Hawaiian leeward islands.

The area of the windward islands is as follows:

Name	Area sq. miles
Hawaii	4,030
Maui	728
Molokai	260
Oahu	604
Kauai	555
Lanai	141
Kahoolawe	45
Niihau	72
Total	6,435

The total area of the leeward islands is in the neighbourhood of 10 sq. miles.

PHYSICAL GEOGRAPHY

STRUCTURE

The group stands on a submarine ridge extending some 1,500 miles from Kure island in the west to Hawaii in the east. The leeward portion is almost completely eroded, and all that remain to-day are a few uninhabited rocky islets and coral atolls built on the submerged mountain tops at the west end of the chain (Fig. 94). These will be

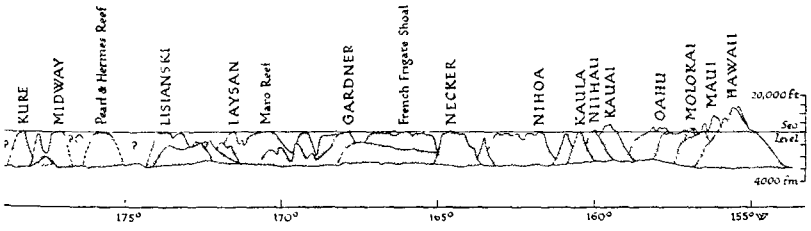


Fig. 94. Profile of the Hawaiian islands

Vertical scale exaggerated about 45 times. Based on a drawing by E. H. Bryan Jr. in *Paradise of the Pacific*, vol. LI, no. 11, p. 13 (Honolulu, 1942).

discussed separately. The eight inhabited islands of the windward group are volcanic mountains of varying ages and show various phases of development. In all there are the remnants of fifteen distinct volcanoes, five forming the island of Hawaii, two each forming Oahu, Maui and Molokai, and one forming each of the other islands.

The oldest domes—Waialeale in Kauai, the Kohala range in Hawaii, the whole of Oahu and the western part of Maui—are more or less

contemporary. They are all characterized by exceptionally heavy erosion which has resulted in deep canyons where the basaltic lava rock has been eaten away by water action and the salts from decaying vegetable matter. Swamps occur on the tops of the mountains in Kauai and Molokai and feed the streams flowing through the canyons, sometimes as much as 1000 ft. deep. Tributary to these canyons in the higher ground are numerous small streams which have cut shallower channels through the lava.

Considerably more recent, but inactive, is Haleakala, which forms the whole of the eastern part of Maui, and rises to a height of 10,032 ft. The north-eastern side of the mountain exposed to the trade wind has been cut into numerous canyons and gorges. The crater at the top, the largest in the world, is L-shaped with a length of $7\frac{1}{2}$ miles and a width of $2\frac{1}{3}$ miles; it is 2,000 ft. deep. At each end the walls of the crater have been split as a result of faulting. The Kaupo gap and the Koolau gap so formed are about a mile and a half wide; through these lava has escaped and so prevented the filling up of the crater. The barren floor of the crater is studded with sixteen cinder cones, the largest of which has a height of about 700 ft.

Volcanic Activity

Four volcanoes have erupted in historic times. They are, from north-west to south-east: Haleakala on the island of Maui, 10,032 ft., last eruption about 1750; on the island of Hawaii, Hualalai, 8,269 ft., last eruption in 1801; Mauna Loa, 13,675 ft., erupting on an average every four and a half years, last eruption 1940; and Kilauea, 4,090 ft., almost continuously eruptive. Thus the activity has declined north-westwards, but it cannot be concluded that the first two volcanoes are extinct. In 1929 the Hualalai area was shaken by many earthquakes causing severe damage, and the evidence indicates that these were occasioned by a subterranean movement of lava into the volcano from beneath Mauna Loa.

Mauna Loa, rising 29,000 ft. from the ocean floor, is the world's greatest active volcano, both as regards its size and the magnitude of its lava outpourings. It is a dome with gently sloping sides (about 8°), and the summit crater, Mokuaweoweo, elliptical in plan ($3\frac{1}{2}$ by $1\frac{3}{4}$ miles), is hundreds of feet deep with steep walls. Lava appears at times in the crater, but the greater outpourings burst from opening rifts on the flanks of the mountain. Rifts extend from the crater for 35 miles to the south-west and for 15 miles to the east-north-east;



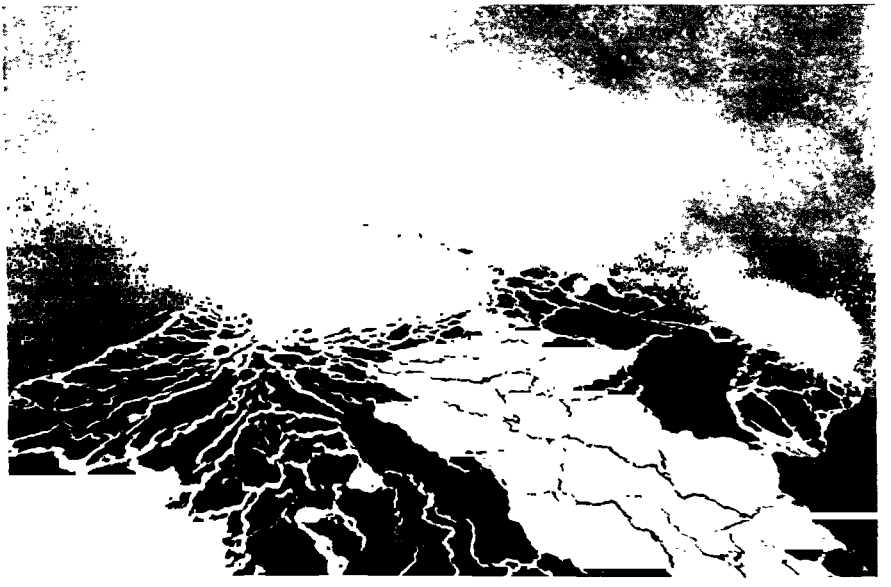
Plate 58. Road on Hivaoa, Marquesas

Part of a track, suitable only for horses or pedestrians, in the vicinity of Atuona. The rugged landscape gives an indication of the difficulty of road making in these islands. Photograph taken in 1931.



Plate 59. Catholic mission church at Taiohae, Nukuhiva

The building is surrounded by groves of banana plants, breadfruit trees and coconut palms.





Plates 60, 61. Lava flows, Hawaii

Plate 60 (above) shows glowing liquid lava and lava fountains in the pit of Halemaumau at dawn, 20 February 1929. Plate 61 (below) shows rope-like surfaces of *pahoehoe* lava near the southern rim of Halemaumau, 3 February 1919.

the majority of the flows have come from between 3,000 and 13,000 ft. In 1877 there was a submarine eruption from the floor of Kealakekua bay due west of the summit of Mauna Loa. Steam appeared a mile offshore, and boats which were rowed through the scene of action were frequently hit by rising pieces of lava. These lava fragments, light and frothy, were red hot when they reached the surface of the water, but they quickly cooled and sank.

Kilauea is a similar but smaller dome on the side of Mauna Loa, with an elliptical summit crater, in the floor of which is a steep-sided circular pit, Halemaumau, about 4,000 ft. across. Flank eruptions are rare, but at intervals lava appears in the pit, and as the locality is easily accessible this unique fire lake of liquid rock is a great tourist attraction. The lake glows at night, particularly through cracks in the cooling surface crust (Plate 60), and fountains—sometimes in hundreds—shoot high into the air. The surface level of the lake is subject to rapid rise and fall. A fall of 700 ft. in one day has been observed, and in 1919 the pit filled and the lava overflowed on to the main crater floor. The lake is hotter at its surface (a temperature of 1185° C. has been measured) than below. This is due to the heat generated by the combination of the lava gases with one another and with oxygen of the air. The main gas evolved is steam—about 70%. Carbon dioxide, nitrogen, sulphur, sulphur dioxide, sulphur trioxide, carbon monoxide, hydrogen, chlorine, and argon are also found.

In 1912 an Observatory was built near the north-eastern edge of Kilauea crater, and no other volcano in the world is so closely watched. The work of the permanent staff includes the recording of earthquakes, observations of temperature, and of the changing widths of cracks, whilst delicate tiltmeters measure the tilting of the ground to an accuracy of one-hundredth of a second of arc. It has been established that with rise and fall of the lava within the mountain the summit rises and falls by some feet, the dome for a radius of 20 miles being tilted away from the crater. The volcano has been likened to a boil, filling and swelling, and then subsiding on evacuation through some underground crack.

The Hawaiian volcanoes belong to the class known as 'shield' volcanoes, formed by the relatively non-explosive emission of very fluid lava, which may travel for tens of miles, sometimes with the velocity of a torrential river. In historic times only one considerable explosive outburst throwing out volcanic bombs and ashes has been recorded—that of Halemaumau in 1924. The craters, in contradistinction to the smaller cone-shaped funnels of volcanoes of the

explosive type, are steep-sided, large, flat-floored expanses (calderas) produced by subsidence of the central summit areas of the domes. With the boiling off of gases from the lava surface the liquid may be shot into glassy threads known as Pele's hair, and these with strong winds have fallen quite thickly in Hilo some 30 miles away. The surface of the congealed lava may be of the comparatively smooth kind (known as *pahoehoe* (Plate 61)) or blocky and rough (known as *aa*). The latter is extremely difficult to traverse. The same lava flow may be *pahoehoe* in one region and *aa* in another.

The volcanic activity in Hawaii is not a menace to life, but the lavas may travel far from the source of the eruption and flood the lowland settlements. The fishing village and harbour of Hoopuloa were destroyed in 1926 by a flow originating 15 miles away on Mauna Loa. The long travel of the lavas, despite the cooling and solidification which quickly follow exposure to the atmosphere, is made possible by the growth of a superficial crust of cooled rock beneath which the liquid continues to move downwards in an insulated tunnel, thus feeding the forward movement of the front which may continue for weeks.

At the end of 1935 the first experiment of its kind to curb this destructive force of nature was made, in the face of native fears of angering Pele, the Polynesian goddess of fire. A flow advancing at the rate of more than a mile a day had travelled half-way (15 miles) to Hilo from a source at 8,500 ft. on the north-eastern flank of Mauna Loa, and fears were entertained for the city. Six tons of 600 lb. T.N.T. bombs were then dropped on the source from army aeroplanes in the hope of breaking the covering crusts, clogging the tunnels, and thus cutting off the supply of the flow. The experiment was entirely successful. Lava re-emerged at the source, and 33 hours after the bombing the advance of the lower lava front slowed down, to come to a stop in four days.

Coasts

(Plates 62, 63, 64)

Subsidence and subsequent raising of the land have occurred in Kauai and Oahu with the result that a coastal plain of raised coral limestone surrounds Oahu and borders the eastern side of Kauai. The inner boundary of the limestone area is marked by cliffs cut back by wave action when this part of the island was submerged.

On the coast of most of the islands cliffs occur; these are caused in



Plates 62, 63, 64. Types of coastal landscape, Hawaiian islands

Plate 62 (above) shows the flat sandy beach near Honolulu, the coastal plain on which the city is built, and the rugged eroded mountains behind. Plate 63 (middle) shows steep cliffs on the east coast of Hawaii, with flat land planted with sugar cane above, and the snow-clad Mauna Kea in the background. Plate 64 (below) shows the leper settlement at Kalaupapa, Molokai, with the steep mountains and deep valleys characteristic of the north-east coast of the island, making communication with the interior difficult.

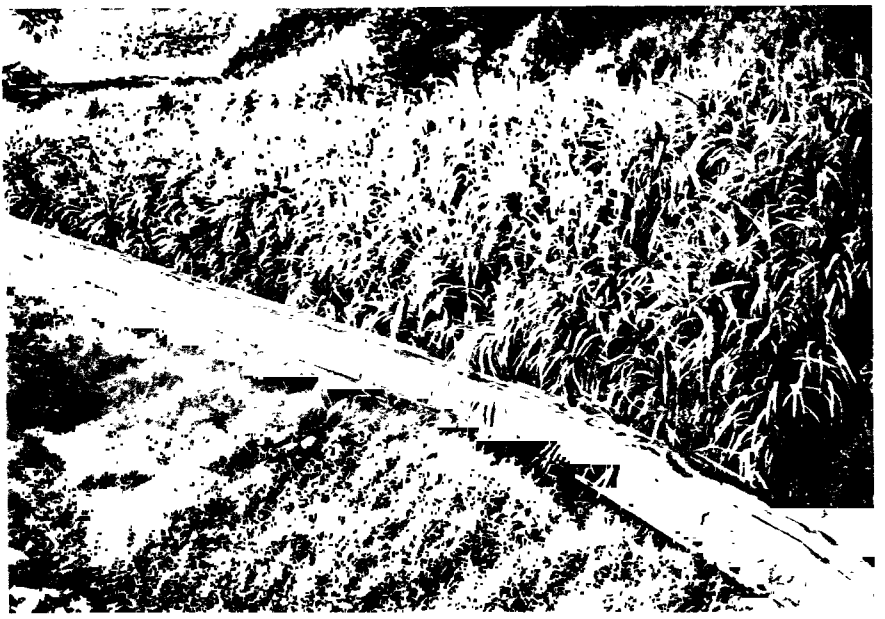


Plate 65. Sugar cane and flume near Hilo, Hawaii

Flumes are used in the island of Hawaii to carry sugar cane by water from the plantations to the mills. The cane here shown is about 8–10 ft. high, and the flume is about 2 ft. 6 in. wide.



Plate 66. Planting pineapples through mulching paper

Absorbent paper is laid down from rolls towed behind tractors; it serves to conserve moisture and to check the growth of weeds.

some cases, notably on the east coast of Hawaii, by wave action. In others, such as the north-east coast of Molokai and the Napali region of Kauai, where cliffs reach a height of 2,000 ft., they are probably produced by faulting. Flat sandy coasts are found in some islands, usually on the lee side. Coral reefs occur, especially off the low sandy beaches, but have not developed to the same extent as they have in the warmer regions near the equator. The Hawaiian islands are the extreme northern limit of coral distribution. It is probable that the water is too cold for the rapid formation of coral, and the depth of water close inshore in many places is another inhibiting factor (see Individual Islands, Chapter X).

Anchorages and Landings

As a general rule anchorages are scarce on the north-east sides of the islands exposed to the trade winds. On the south and west coasts (which are usually flatter) there are many convenient anchorages. Brief mention is made of these in the section dealing with individual islands but full details of them, and of minor landings not considered in the section on ports, are covered in the *United States Coast Pilot, The Hawaiian Islands*, 1933.

CLIMATE

Although the Hawaiian islands are situated within the limit of the tropics, their climate is not universally what is known as tropical. There is considerable difference in both temperature and rainfall for various localities.

The whole climatic environment is conditioned by the north-east trade winds. They blow with constant velocity throughout the year, being slightly more variable from November to March, and more easterly from June to September. During the period approximately from October to April they are occasionally interrupted by *kona* winds from the south, usually of short duration and often accompanied by heavy rainfall. These are probably caused by the troughs of cyclonic depressions, the centres of which move eastward to the north of Hawaii and which vary in their occurrence from year to year. The term *kona* is derived from the Hawaiian word meaning leeward or south-west.

The rainfall varies greatly from place to place. The high mountain ranges and peaks of the larger islands standing in the way of the prevailing moisture-laden trade winds cause these to rise suddenly and

the resulting cooling causes precipitation. Rainfall, therefore, is uniformly heavier on the windward sides of the larger islands (Fig. 95) and on the small windward islands. But Niihau in the lee of Kauai and Kahoolawe in the lee of Maui are often virtually without rain for a whole year. On Oahu the mean annual rainfall of Honolulu is 28·6 in., while at the Pali, high in the mountains, it is 110 in. At Hilo on the north-east coast of Hawaii it is about 140 in., while at Waialeale, the summit of Kauai, it is 467 in., a figure which rivals that of Assam, the wettest region in the world. Generally speaking the maximum precipitation occurs between 2,000 and 5,000 ft.

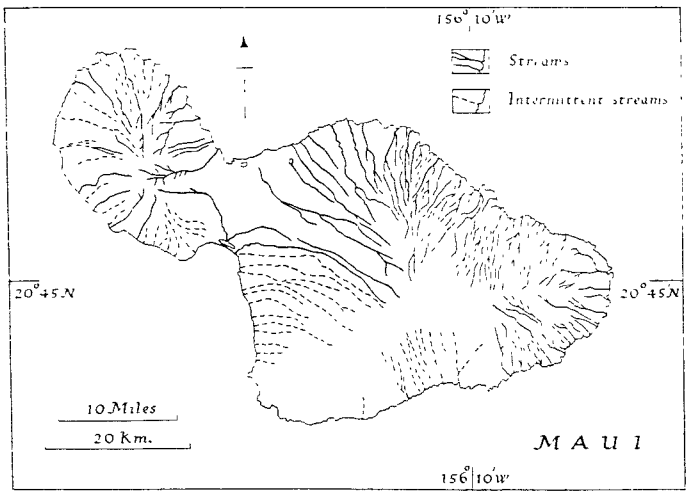


Fig. 95. Maui: drainage

The remarkable concentration of streams on the north-east coast is due to precipitation from the north-east trade winds; on the (leeward) south coast streams are few and intermittent. This is typical also of the island of Hawaii. Based on U.S. Coast and Geodetic Survey chart no. 4116.

Fig. 96 shows the mean annual precipitation on the island of Oahu. Similar distribution is characteristic of the other islands in the windward group.

Rainfall is the most variable of all the weather phenomena. The precipitation from a single *kona* storm on the lee side of the islands may exceed the whole of the normal annual rainfall for the district. (Fig. 97 shows the monthly rainfall in Honolulu over a period of five years, and shows clearly the variable nature of *kona* rain.)

Temperature is governed by the same factors as rain. The windward sides of the island are cooler than the leeeward sides, and tem-

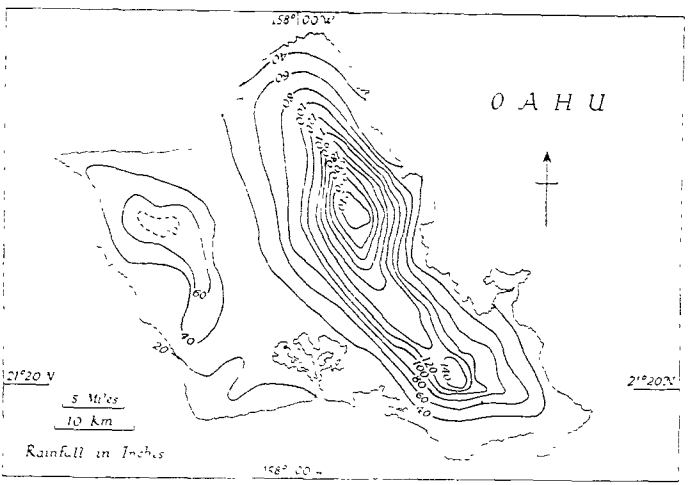


Fig. 96. Oahu: distribution of mean annual rainfall

Heavy rainfall on the east coast, with maximum precipitation at about 5,000 ft., is typical of all the larger islands of the group. Based on Stephen B. Jones and Rolland Bellaire, 'The classification of Hawaiian climates', *Geographical Review*, vol. XXVII, p. 114 (New York, 1937).

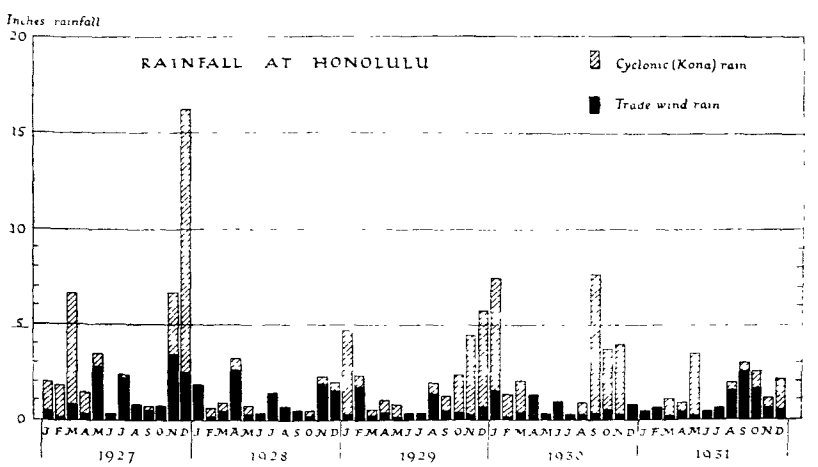


Fig. 97. Rainfall in trade winds and *kona* (southerly) winds

Data from Honolulu, 1927–31. Based on Stephen B. Jones, 'The weather element in the Hawaiian climate', *Annals of the Association of American Geographers*, vol. XXIX, p. 43 (Lancaster, Pa., 1939).

perature naturally decreases with altitude. The inhabitants of the leeward sides of many of the islands enjoy a perennial Mediterranean summer. In Honolulu the average monthly temperature for August, the warmest month of the year, is 78° F., with a mean daily maximum and minimum of 83 and 73° F. respectively. For January the average monthly temperature is 70° F. with a mean daily maximum of 76° F. and a mean daily minimum of 66° F. On the south side of Kauai the corresponding figures are 78 and 70·7° F. On the windward coasts the temperature is lower. At Hilo in the island of Hawaii the range of average monthly temperature is from 75 to 69·9° F. On the north-west of Maui it is from 72·2 to 67·1° F.

The barometer shows remarkable uniformity, the mean monthly pressure varying from a maximum of 1018 mb. in April to a minimum of 1016 mb. in January, September and October. At Honolulu the greatest monthly variations occur in January, between 1026 and 1002 mb., or 24 mb., and again in December when the corresponding figures vary from a maximum of 1025 mb. to a minimum of 999 mb., giving a range of 26 mb.

The relative humidity, which is high, varies only from 68 % in the summer month to 72 % in the winter. A more or less permanent cloud cap is formed over Waialeale. Its formation is governed by temperature and wind velocity. On days when the temperature at sea level exceeds 85° F., the clouds rise above their normal level and only the very top of the mountain is covered. When in addition the velocity of the wind drops to below 10 m.p.h. the cloud cap may disappear for a few hours.

Water Supply

Under conditions of such great regional difference in rainfall the question of irrigation is important. The warm climate and heavy rainfall encouraged the growth of the sugar industry on the windward islands but the extremely porous nature of the soil prevented further expansion in the drier leeward regions until considerable irrigation works were undertaken. In 1938 about 133,000 acres of cultivated land were artificially irrigated. Of this 45,700 were in Oahu, 39,400 in Kauai, 37,200 in Maui and 10,771 in Hawaii. Fig. 103 shows the distribution of areas which are watered by irrigation works.

These have taken the form of gravity-fed channels and tunnels through the mountains, and pumping stations and pipe-lines. The porous nature of the underlying basalt rocks provides a large underground reservoir in most islands. Water, which collects in the lower

water-bearing strata of most islands, has been tapped by artesian wells of which there are a great many. A few wells are not artesian but are worked by pumps. They are liable to be brackish, since the underground water supply is connected through the porous rock with the sea and any lowering of the water pressure by pumping allows salt water to seep through the rocks and mingle with the fresh water.

Vegetation and Fauna

The soil of the islands has the character of a light fertile clay with a rich iron and manganese content in places. It is formed largely of disintegrating lava. On the raised coral plains fringing Oahu and Kauai, however, it needs very large quantities of fertilizer to make it profitable. The higher levels of the older islands are bare rocky ridges. Large parts of Hawaii have been destroyed by recent lava flows. These soil differences, in conjunction with differences of altitude and rainfall, have led to a variety of types of vegetation.

Range of Flora

There are in the group altogether about 1,200 different species of plants, mostly tropical in character. A great many are indigenous to the area. Others have been introduced by the Polynesians, and still others by European explorers and modern industrialists.

While not all species are found in every island of the group the more common species are widespread. But owing to the range from a tropical to a temperate climate, it is most convenient to consider plants in groups classified according to their habitat, which is governed largely by altitude. There are five main zones: coastal margin, lowland, lower forest, middle forest and upper forest.

The coastal zone, which includes the seashore and the low ground nearby, with a brackish water supply, is characterized by low shrubs and grasses. Among these are found species of *Scaevola*, a small shrub bearing white or pale blue flowers. Types closely related to this plant also occur at higher altitudes.

Among other plants of the littoral zone are the sea morning-glory and various other varieties of convolvulus. Natives use the roots of one species of this as a cathartic. There are two species of heliotrope, a pickleweed (*Sesuvium*) and many other xerophytic plants specially adapted to the dry sandy habitat. In places many kinds of grass and sedges abound, while where the water is not too brackish bulrushes occur.

The lowland zone stretches from the sea shore to the edge of the lower forest zone at 1,500 ft. It is arid, sandy and rocky. Most characteristic of this zone are the pandanus, *hau* (*Hibiscus tiliaceus*), and the *milo* (*Thespesia populnea*). The wood of the *hau* is of use for making outriggers for canoes, and the tree is generally popular with Hawaiians for the shade it gives. The *ohe* (*Reynoldsia sandwicensis*), a low scrubby thick-set tree 15–20 ft. high, and the *wiliwili* or 'coral tree' (*Erythrina monosperma*) used to be common. Flowers are scarce in this zone; the Mexican thistle, or *puakula*, is the most frequent. Other types include two species of native cotton and four or five species of *ilima*, the flowers of which were traditionally used for making garlands, the popular *lei*.

Plants introduced into Hawaii which are found in this zone include the *noni* (*Morinda citrifolia*), a small tree of the coffee family with an edible fruit, a verbena, which grows to a height of about 6 ft. and is covered with spikes causing considerable trouble on pastures, a dozen or so species of acacia, wild indigo, and many others. Calabashes and bottle-gourd vines were grown by Hawaiians and used for many purposes.

In the lower forest zone from 1,500 to 3,000 ft. are to be found enormous *koa* trees (*Acacia koa*), sometimes erroneously called Hawaiian mahogany, from which canoes are made. Higher up the mountains they reach a height of 70 ft. or so with trunks of a diameter up to 8 ft. More characteristic of the zone are the *kukui* (candlenut tree), the *ki* (*Cordyline terminalis*), and *halapepe* or cabbage tree (also a *Cordyline*). Hibiscus also occurs though it is but rare. Numerous vines thrive in the forest belt, including yams, which used to be a staple article of diet before the introduction of the potato. *Kauila*, a brown close-grained heavy wood growing in this zone was used for spears, clubs, bark cloth, beaters and other utensils because of its toughness and resistance to splitting. A wood of great commercial value, the *ohia*, or mountain apple (*Eugenia malaccensis*), is characteristic of this region, though better adapted to the higher and wetter forest belts. It is common all over the islands. Growing to a height of a hundred feet or so, but with shallow roots, it is easily overthrown. The wood is tough but liable to warp. It is used largely for railway sleepers and for paving blocks. Belonging properly to this zone was formerly the sandalwood, but the unwise despoiling of the forest to provide this commodity for the traders has practically eliminated the wood from the islands.

The predominant or middle forest zone in the islands is generally

between 3,000 and 6,000 ft. in altitude. Here the giant *koa*, the *ohia* and *kamaini* which occur sporadically lower down the slopes come into their own. They form large forests and reach an enormous size. The zone is also characterized by giant tree ferns of many kinds, some with trunks as much as 3 ft. in diameter and reaching a height of 30 ft. It includes too the bird's-nest fern of which there are some forty species; the eagle fern which is very common and provides a food for wild pigs; the *pala* fern, the starch of which provided food for the native population in times of famine. A great handicap to progress through the forests is the *Gleichenia*, of which the forked fronds stretch across paths and form a tangled mass sometimes 6 ft. high which has to be cut away before any advance can be made.

In the upper forest zone above 6,000 ft. more or less warped and stunted variants of the flora of the middle zone are common, growing scarcer higher up, where the country is cooler. Peculiar to this zone are the *akia* and the *pilo*. The former bears small leaves and orange-coloured fruits which are used as a fish poison by the natives. The latter is a large diffuse shrub from 4 to 8 ft. high with small thick fleshy leaves. In the highest regions below the bog there grows a relation of the sunflower, the silversword, with a flower somewhat resembling a chrysanthemum and dagger-like leaves.

On the boggy mountain tops are grasses, sphagnum moss, sedges and a few small plants similar to those found in mountains in New Zealand and the southern Andes.

Introduced Flora

Since a great range of climate is to be found in the islands, and since the islands have received many immigrants, first of all Polynesians, then Europeans, then Asiatics, it is not surprising that there is a great variety of foreign flora in the islands.

All but three out of about forty different palms are introduced. The *algaroba* tree, growing from the seashore to an elevation of 1,500 ft., comes from Central America. Cattle graze off it and the hard seeds are resistant to the digestive processes, so the plant gets spread naturally over the grazing lands. The *kukui* or candlenut tree and the breadfruit are Polynesian introductions.

Among types introduced from overseas may be mentioned the Chilean strawberry, a form of cranberry, the mountain apple, many species of banana, the pineapple, alligator pear, papaya, sugar cane, rice, mango, guava, pomegranate, lemon, orange and lime.

Fauna

The Hawaiian rat was the largest wild animal found by Captain Cook. It has since, however, been exterminated by the European rat. Rabbits were introduced into one or two islands of the Leeward group where they increased so rapidly that steps were taken by the territorial government to exterminate them. The native Polynesians had also brought with them pigs and dogs. Cats were landed from early exploring ships and have since run wild. They are particularly troublesome in the island of Hawaii.

The first deliberate landing of European domestic animals occurred when Cook left one ram, two ewes and a pair of pigs on Niihau. Shortly after, Vancouver landed cattle and sheep and King Kamehameha placed a taboo on them. Protected by the taboo they ran wild and increased, doing considerable damage to forests and later to the plantations.

Large numbers of cattle and sheep are bred on the ranches. The horse was introduced in 1803, deer in 1856, the mongoose in 1883. The latter, imported to combat the rats, does considerable damage to poultry. There are several varieties of lizard, and frogs have been imported as a measure to control mosquitoes.

Introduced birds include the hedge sparrow, lark and pheasant, a few parrots and various domestic fowl. Sea birds, chiefly tropic birds, petrels, terns, albatross and frigate birds occur occasionally in the inhabited islands but populate the uninhabited bird reserve on Laysan island very densely.

HISTORY

Captain Cook discovered the Hawaiian islands on his third voyage, in 1778, naming them the Sandwich islands after the then First Lord of the Admiralty. He found a large and prosperous community living in a feudal state with independent chieftains periodically waging war against one another. This condition of affairs was finally brought to a close in 1795 when Kamehameha succeeded in conquering all the islands except Kauai, which voluntarily submitted in 1810.

During this phase, and indeed for many years after, the islands were visited by exploring expeditions following in Cook's footsteps, by fur traders sailing with cargoes from America to the Orient, and later by sandalwood and whalers traders. American missionaries from Boston first landed in the year 1820.

The history of the kingdom of Hawaii may be said to have three facets. First of these was the diplomatic struggle to avoid annexation at first by Russia and then by the three most active Powers in the Pacific—Great Britain, France and the United States. The other two facets were the religious and constitutional development brought about by European and American contacts; and the growth in importance of the vested interests of the Caucasian population which terminated in the revolution of 1893 and annexation by the United States in 1898.

Rise of the Hawaiian Kingdom under Kamehameha I

At the conclusion of his wars of conquest, Kamehameha found a land depleted by strife and bloodshed, but to organize its recovery was a comparatively simple matter in the primitive stone-age economy of the times. He followed the normal Polynesian tradition of dividing up the land among his feudatory chiefs who in turn divided their portions among their followers.

British and Americans, engaged in the north-west coast fur trade, regarded the Hawaiian islands as a convenient point for revictualling and rest on their long voyages to the Orient. They exchanged iron, liquor and firearms for supplies. Frequent quarrels between these men and the Hawaiians often led to bloodshed. For example, a certain Captain Metcalfe seized and flogged Kameeiamoku, a chief of the islands. In revenge the Hawaiians seized a boat of Metcalfe's and dismantled it for the iron nails with which it was built. Metcalfe then opened fire on canoes clustered around his ship, killing large numbers of Hawaiians. In the following year a band of Hawaiians seized the *Fair American*, commanded by Metcalfe's son. The only survivor from the ensuing massacre was the mate Davis. He and Metcalfe's bosun John Young, already ashore, were detained by Kamehameha to prevent further complications. After an unsuccessful attempt to escape they became reconciled to the life of the islands, married Hawaiian women of high rank, and became the first European advisers of the king. Young ultimately rose to be governor of the island of Hawaii. These two men were of inestimable assistance to Kamehameha in his relations with the traders. They served him so well that he soon gathered round him a band of white advisers, of whom Don Francisco Marin, a Spaniard, was perhaps the most interesting because of his many agricultural and horticultural ventures.

As the trade in furs increased, more and more ships of all nations visited the islands. They anchored in the roadstead at Honolulu, which soon became the principal trading centre. The early traders discovered that sandalwood grew in the islands and exported quantities to China, at first simply as an additional cargo in the fur ships but later as full cargoes direct. Sandalwood became a royal monopoly, and practically the whole native population, men, women and children, were compelled to hew the wood and carry it to the coast. During Kamehameha's reign there was some attempt at preservation, but in the succeeding reign the islands were completely exhausted, and to-day there is virtually no sandalwood in the Territory. In exchange for the sandalwood Kamehameha received quantities of silks, guns, ammunition, and when he learnt its value, silver. In 1805 he acquired a brig from the Americans, and from this beginning built up a small fleet numbering some thirty European vessels as well as many canoes. This force, originally intended for the subjugation of Kauai, evolved into a mercantile marine. In 1816 he determined to embark on the sandalwood trade himself and equipped two vessels to carry sandalwood to Canton. Harbour dues and other charges ate up the profit he would otherwise have made. Profiting immediately from the lesson, he instituted harbour dues at Honolulu. The warehouse he had already built and the dumps of the foreign traders near the shore combined to make Honolulu the base for the whole entrepôt trade of the group.

As trade increased and the foreign traders were joined by merchants and ships' chandlers, a process was begun which was comparable to the growth of English and French settlements in India. The arrangements made about these establishments were purely informal agreements between the king and foreign merchants. At this time the European and American governments were either not interested in the islands or unwilling to embroil themselves in complications with their neighbours by the seizure or annexation of the group. A German adventurer named Dr Scheffer, in the service of the Russian fur-trading company, had attempted to establish a fortified trading post in the islands in 1815. He was allowed to land at Honolulu and immediately built a blockhouse and was in process of building a fort when the Hawaiians ordered him to withdraw. This he did, sailing away to Kauai. The Hawaiians completed the fort for their own use. In Kauai Scheffer induced Kaumualii, the king of that island, to allow him to build a fort at Waimea. This attempt was also abortive, for Kaumualii acting on Kamehameha's instructions ex-

pelled him from there too. Scheffer's actions were repudiated by the Russian government and the first overt threat to Hawaiian independence was removed.

Accession of Liholiho and Introduction of Christianity

On the death of Kamehameha in 1819 his son Liholiho succeeded to the throne, assuming the title of Kamehameha II, but with his father's favourite wife, Kaahumanu, a lady of advanced ideas and strong character, as *Kuhina Nui* or prime minister. This lady, no doubt animated with a desire for equal rights for women, and with the example of Europeans before her, broke the traditional taboo on women feeding in company with men. The initial dinner party, known as the *ai noa* or 'free eating', was of great significance in the history of the island. It was an experiment which demonstrated the impotence of the old gods. Orders were given to destroy the *heiau* (temples) and burn the idols. The priests and the more conservative elements of the population rose in revolt and were defeated by the royalist party. The ground was therefore fully prepared for a missionary expedition which set out from Boston in 1819 to convert the Hawaiian islanders.

Certain Hawaiians, who had shipped as sailors to the United States, had been converted to Christianity and aroused considerable interest in the Hawaiian islands among the churches of New England. In 1819 therefore the 'Sandwich Islands Mission' was organized in Boston under Hiram Bingham and its representatives set sail in October of that year for Hawaii. They were welcomed and established mission stations at Kailua and Honolulu, and in Kauai. At first their progress in evangelizing the natives was slow compared with their rapid spread of education. They established schools in various localities, reduced Hawaiian to a written language and began teaching English. William Ellis, the pioneer missionary of the London Missionary Society, visited them from Tahiti and remained in Hawaii to help them for some time. Opposition came not from the Hawaiians but from the traders and settlers. In time, however, the whole kingdom, with certain minor exceptions, became Christian and the official religion of the court was Protestant. Certain traces of this missionary influence could be seen in the legislation of the period. Prohibition was enforced and strict sabbatarianism enjoined.

The Beginning of Formal Diplomatic Relations with the Powers

So far only the normal internal day-to-day relations with traders and missionaries have been considered. At first there was no regular intercourse with foreign governments. Captain Cook and after him Vancouver had given what might be called the foreign policy of the kingdom a decidedly pro-British trend. Kamehameha had a verbal agreement with Vancouver, placing his kingdom under the protection of Great Britain, and in accordance with a promise made by Vancouver the British government presented a small schooner suitably armed to the kingdom of Hawaii in 1822. Kamehameha II, anxious at the infiltration of large numbers of Americans, or perhaps merely impatient at the apparent lack of interest shown by Whitehall, set out on a voyage to England. The king and queen died of measles before an interview could be arranged, but the surviving members of his suite were received by George IV at Windsor Castle, where they were assured that Great Britain would protect the islands while leaving them at the same time entirely free to manage their own internal affairs. The bodies of the king and queen were returned in H.M.S. *Blonde*, Captain Byron. Apart from these attentions and the appointment of a British consul, the British government apparently found no reason for taking further action. The United States had already appointed a 'commercial agent', or consul, in 1820.

Reign of Kamehameha III

American interests in the islands were growing all the time and there were frequent visits by United States warships. The captain of one of these in 1826 negotiated a treaty of peace and friendship between Hawaii and the United States. The young king Kamehameha III therefore found himself theoretically protected by treaty from the two Powers which up to this time had shown the greatest interest in the islands. An attempt to establish a Catholic mission by two French subjects caused many complications. The king, no doubt in part influenced by the existing Protestant missionaries, expelled them. They were re-established under threat of bombardment by the captain of the French frigate *Artémise*, who, full of the dignity and importance of France, insisted on the signing of a commercial treaty. This granted extra-territorial rights in the kingdom to French subjects, and admitted French wines and brandies into the islands,

subject to a tax of not more than 5 %, and provided for the appointment of a consul.

The period was one of great French activity in the Pacific. The French had annexed the Marquesas islands in 1842 and established themselves in a dominant position in Tahiti. When therefore the French warship *Embuscade* arrived off the islands in 1842 there was considerable anxiety in the minds of the Hawaiian government. This was augmented by the action of the British consul who was anxious to make Hawaii a British possession. Ambassadors were accordingly sent to the United States and to Europe to reiterate their claim to independence. Meantime Capt. Lord George Paulet, H.M.S. *Carysfort*, arriving off Honolulu in 1843 in answer to a complaint from the British consul, annexed the islands, set up a provisional government, and raised a regiment of native troops. Complaints reached Admiral Thomas, at Valparaiso at the time. He took immediate action before the result of the ambassadors' expedition had become known. He sailed to Honolulu, countermanded Captain Paulet's instructions, and restored the kingdom to Kamehameha.

After considerable delays caused by the colonial rivalry of Great Britain and France the independence of Hawaii was formally recognized by both governments and a joint declaration to this effect was signed in London in 1843.

The reign of Kamehameha III was marked by considerable constitutional advance. His predecessors had ruled by absolute right, but sought the advice of foreigners wherever and whenever they felt it necessary. He extended the policy of appointing foreigners as cabinet ministers to strengthen his hand in negotiations with foreign traders and foreign governments. William Wyllie, a Scottish doctor, for example, was appointed Secretary of State for Foreign Affairs in 1845 and retained this position for many years, and two American subjects, John Ricord and G. P. Judd, became Attorney-General and Home Secretary. Under the advice of such men numerous constitutional reforms were made. The *mahele* or 'great division', abolishing feudal tenure and dividing land among the people, but reserving certain areas as crown lands and others as royal demesne, was probably the most fundamental. A form of parliamentary government was set up, progressing by small steps until a formal constitution was drafted in 1852 granting virtually universal suffrage.

Growth of American Influence

The number of American residents increased chiefly as a result of the whaling trade, and the discovery of new whaling grounds off the coast of Japan. It became the practice of the whalers to remain in the Pacific for years at a time, basing themselves on Honolulu. The natural result of this was that many Americans came to the islands to establish stores and warehouses, to supply the whaling ships, and to provide for the transport of whaling products to the mainland of America. The opening up of California, too, played an important part in increasing American preponderance in Hawaiian affairs. In 1853 the first serious proposals for annexation were made. The project was freely discussed in American circles in Honolulu and in 1854 the king, yielding to the popular clamour, entered into negotiations with Mr Gregg, the American diplomatic representative, with a view to drafting a treaty of annexation. For various reasons, partly owing to the unwillingness of the American government, and partly to the insistence by Mr Wyllie that the kingdom should be granted the full standing of a state within the Union, these negotiations came to nothing. A danger that the kingdom might be seized by a filibustering expedition from California was averted by the presence of English, French and American warships at Honolulu.

The Struggle for Independence and the Growth of Commercial Ties with America

The reign of Kamehameha III had seen the development of the kingdom into a constitutional monarchy and various attempts by the major powers on the sovereignty of the islands. His successors, who generally showed a mildly reactionary temperament, spent their time endeavouring to strike a balance between the influence of the various European pioneers, and to restore the royal prerogative. Their policy was affected by the growth of the sugar-planting industry and the need to find an outlet for the crop.

Kamehameha IV, who with his brother had visited both the United States and Great Britain and who had married Miss Emma Rooke, the granddaughter of the English seaman John Young who had advised Kamehameha I, started his reign with strong pro-British sympathies. With a memory of the annexation threat of the previous reign, he was further determined to reduce the power of the American settlers. During his short reign of nine years from 1854 to 1863, all American

missionary connexions were removed from the cabinet, and a Church of England bishop was appointed. In an attempt to offset the decline of Hawaiian population he also endeavoured to induce other Polynesians to immigrate. The need for a market for sugar was, however, beginning to make itself felt, with the result that further ties with the United States were initiated by an attempt to draw up a reciprocity treaty admitting Hawaiian sugar to the United States free of duty. But the project foundered on the rock of opposition from American domestic sugar interests. Kamehameha V, who succeeded his brother in 1863, abolished the constitution of 1852, thus restricting the franchise to a property qualification and reducing the influence of the settlers on the elections. The change was brought about in the teeth of great opposition especially from the American interests.

But economic necessity was to drive the government once again to endeavour, unsuccessfully as it happened, to bring about a treaty with the United States. The decline in the whaling industry had compelled the islands more and more to depend on sugar for a livelihood. During the American Civil War large quantities of sugar were exported and the price was high enough to show a large profit even after paying duty. With the restoration of peace the sugar from the southern states was again available to compete with that from Hawaii and the price became uneconomic. The planters in Hawaii had meantime imported large numbers of indentured labourers and there were more mouths to feed than before.

When Kamehameha V died in 1872 without issue and without nominating a successor, William Lunalilo, a chief in high favour with the foreign settlers, was elected. He appointed a cabinet predominantly American. Yet another attempt was made to obtain a reciprocity treaty but still without success, although the tempting bait of Pearl harbour as a coaling station was offered to the American government. The planters, despairing of the reciprocity treaty, had begun to export sugar to Australia and New Zealand, and the possibility of arranging such a treaty with these countries was seriously discussed. There thus arose the paradoxical situation that with a pro-British king on the throne, the economic centre of gravity had been in America, but when a pro-American king ruled the economic attraction was in the British Empire. The reign of Lunalilo was a short one, for he died in 1874 to be succeeded by Kalakaua. In response to the clamour of the settlers yet another attempt was made to obtain a treaty of reciprocity, this time successfully. The general terms of the treaty provided for the free import into the United States of Hawaiian

sugar and the free import of specified American goods into Hawaii. An additional clause of great importance forbade the conclusion of any similar treaty between Hawaii and other powers, or the alienation of any Hawaiian territory. A factor of some moment in modifying the American attitude was the fear that a similar treaty would be negotiated with New Zealand and Australia. Such a treaty would of course have closed the door to American goods in Hawaii.

Economically the treaty was to prove an immense boon to the territory and to establish the sugar industry on a firm footing. Politically of course, though this was not the desire of the Hawaiian government, its effect was to draw the islands closer still to the United States.

It is significant of the strength of American economic penetration that an act of 1884 made the American dollar the official currency of the kingdom.

The Importation of Contract Labourers

The impetus given to the sugar industry by the reciprocity treaty was retarded by labour difficulties. The early indentured labourers were insufficient to meet the demands of the growing expansion of the sugar plantations.

Successful plantation agriculture is dependent on a plentiful supply of cheap and docile labour for which the Hawaiian population was unfitted by inclination and temperament. The solution adopted was to import contract labour from other parts of the world. It is therefore essential in any study of the history of Hawaii to consider the immigration of large numbers of foreign stock which to-day form about 85 % of the population of the territory.

The importation of indentured labour had already begun in 1852 with the introduction of 293 Chinese coolies. Since then systematic immigration, first by Chinese, then by Japanese, Portuguese, Porto Ricans, Koreans, Spaniards, and last of all by Filipinos, provided labour for the plantations. Various considerations governed the choice of labourers at different times. The conditions under which they came were also modified by their respective governments. The Hawaiian government, rendered anxious by the rapid fall in the native population, hoped to arrest the decline by encouraging the importation of peoples 'racially cognate' to the Hawaiians. Attempts were made to induce other Polynesians to come to the islands. This policy was not successful, and from 1868 considerable inducements

were offered to the Japanese, who for the next forty years or so became the staple source of indentured labour. Early opinions of the Japanese were characterized by a certain optimism. An early authority described the Japanese as 'more like the natives of these islands than any others we could get to emigrate here, and there was not the slightest doubt that they would most readily amalgamate'. Unfortunately, this prognostication did not prove true. The Japanese have intermarried less than any other ethnic group in Hawaii.

Intervention by the Japanese government secured very favourable terms for their subjects. A labour convention of 1884 provided among other things an agreement for three years with wages at $9 a month with a food allowance of $6, and, which was more important, that 30 % of the people imported should be women. The Japanese thus, unlike the Chinese, who came as unattached males, were able to establish a family life with their own people, and later the importation of 'picture brides' ensured a normal sex ratio for the Japanese.

Portuguese immigrants were even more favourably placed. The Hawaiian government, still anxious to find a race of immigrants who would blend with the Hawaiians, encouraged settlement of indentured labourers from Madeira, offering a rate of $16 per month for contract labour. Out of roughly 10,000 Portuguese brought to Hawaii previous to 1887, roughly 46 % were children and 26 % women. Koreans and Porto Ricans were also introduced into the kingdom, but in relatively insignificant numbers. After annexation by the United States and the consequent closing of the door to Japanese and Chinese labour, recruits were obtained almost entirely from the Philippines, especially between 1910 and 1920. Throughout this last phase of immigration the ratio of men to women has been between four and five to one.

This search for labour has made the Territory of Hawaii one of the most cosmopolitan regions of the Pacific, but political and economic control was to remain in the hands of the *haole* (foreign) population.

Kalakaua's attempt to form an Oceanic Federation

In the course of his reign, Kalakaua made a voyage round the world to strengthen his diplomatic bonds with other nations and to offset the growing American domination. He was received with great friendship in Japan, but the expedition accomplished nothing of great importance.

An interesting but unsuccessful attempt to improve the independent position of the kingdom was made by a proposal to federate the remaining independent Polynesian islands into a union under Hawaiian leadership. For this purpose Kalakaua sent commissioners to the Gilbert islands and the New Hebrides with the ambitious notion of offering them a Hawaiian protectorate. He followed up these tentative moves by dispatching the steamship *Kaimiloa* on a good-will cruise to Samoa. The venture met with initial success. Malietoa, king of Samoa, was ready to welcome any alliance which would strengthen him against German encroachments. The conception of such a federation was ingenious, but was too late. European expansion in the Pacific had already accomplished too much. Diplomatic protests were made by the major powers, and the German government, already particularly interested in Samoa, went so far as to detail the corvette *Adler* to shadow the *Kaimiloa*.

The United States, whose economic interests in Hawaii were already considerable, induced the Hawaiian government to withdraw from the alliance, which could not fail to lead to serious complications with Germany. The fact that Hawaii yielded to American representations is an interesting indication of the political dominance of the United States in Hawaiian affairs at the time.

Reign of Liliuokalani and the Revolution

Kalakaua died in 1891 on a visit to the United States. He was succeeded by Queen Liliuokalani. The last years of his reign and the beginning of the Queen's reign were marked by serious discontent with the policy of the Foreign Secretary, Mr Walter Murray Gibson, a former Mormon missionary. He was charged with mismanaging the finances of the kingdom, and with the responsibility for the introduction of a lottery bill. The general discontent was fostered by the 'annexationist' American party and by an effort to modify the constitution to their detriment.

The revolution which resulted in the expulsion of the Queen from the throne was in the nature of a *coup d'état*; not more than about 150 people were concerned on each side. Tension was high, and marines were landed from an American warship in the harbour to protect American property.

The royalist party, perhaps overawed by the presence of American armed forces, who might be expected to support their compatriots, capitulated without resistance. The revolutionary government im-

mediately dispatched a request to the United States asking that the islands might be annexed. British and Japanese warships appeared but took no action against the temporary American protectorate declared by the commander of the United States warship *Mohican.*

Annexation was not to be achieved till 1898. Since the *coup d'état*, a presidential election had taken place in the United States, and the new President, Cleveland, opposed to annexation, sent to the islands a commission which declared that the revolution was a conspiracy of a small party of interested American planters. In due course a further commission was dispatched with the intention of restoring the Queen. The president of the Hawaiian provisional government, Mr Dole, aware that Cleveland was not supported by the whole of Congress, protested with ironic inconsistency that the United States had no right to interfere in the domestic affairs of Hawaii. In due course when Cleveland was succeeded as President of the United States by McKinley, the republic was absorbed into the United States by 'joint resolution'. Two years later, in 1900, it was organized as a territory of the Union.

Whatever views may be held on the justice of the revolution and the annexation of the kingdom there is no doubt that economically the ties between the two countries were close and would have grown closer. The Spanish-American war, ending with the acquisition of Guam and the Philippines, made Hawaii as an intermediate link in the chain across the Pacific strategically more desirable than ever to the United States. Hawaii, as an independent kingdom, had developed too late and was too small to stand alone. The danger was that it would be seized by Japan, Germany, France or possibly Great Britain. Annexation by any of these countries, in view of the large American-born population of the islands, would have caused considerable difficulties and possibly have led to war in the Pacific.

Modern Hawaii

During the present century the history of the islands has been one of steady development of the sugar and pineapple industries, the growth of the tourist trade, and the development of Pearl harbour as perhaps the most strategically important military establishment in the Pacific. The territory has become a modern settlement in which American culture predominates. The ethnic, economic and political problems which have gone hand in hand with commercial development are discussed below.

POPULATION

Density and Geographical Distribution

The total population of the Territory of Hawaii at the census of 1930 was 368,300. The figures for each island were as follows:

Oahu	202,887
Hawaii	73,325
Maui	48,756
Molokai	5,032
Lanai	2,356
Kahoolawe	2
Kauai	35,806
Niihau	136
Total	368,300

Estimated figures for 1941 were as follows:

Oahu	310,503
Hawaii	68,398
County of Maui (including Molokai, Lanai and Kahoolawe)	52,959
County of Kauai (including Niihau)	33,479
Total	465,339

There are no recent figures accessible for the individual islands grouped together to form the counties of Maui and Kauai respectively. But since the totals for the individual islands forming these counties for 1930 approximate roughly to the figures for 1941 for the counties as a whole, it is a reasonable inference that there has been little change in the population of the islands concerned. Practically all the increase has been in the island of Oahu and is no doubt in part caused by an increase in the armed forces stationed there. (The Midway base is omitted from the above analysis.)

The densities of population for each island and for the territory as a whole are as follows:

Island	Population per sq. mile
Oahu	334
Hawaii	18
Maui	66
Molokai	19
Lanai	16·5
Kahoolawe	0·004
Kauai	65
Niihau	1·9
Territory	57

Apart from large aggregations of population in the cities of Honolulu and Hilo, the principal ports of the territory, the majority is distributed along narrow coastal belts. It has been estimated that 85 % of the population lives within 3 miles of the sea.

The rural population is almost entirely engaged in agriculture. Work on the pineapple and sugar plantations occupies most of the labour. The grazing land on the higher or more infertile slopes supports a very small population indeed. Small-holder agriculture, including taro growing by Hawaiians and rice growing by Chinese and Japanese, is mainly confined to small areas in the mouths of river valleys.

There is a very close correlation between the distribution of the population and the distribution of land devoted to the major crops (Figs. 104–109).

Urban Population and Predominance of Oahu

Density of population between the various islands varies largely as a function of the agricultural production of each, but the island of Oahu with 65 % of the population has a density far exceeding that of any other island. There are two main reasons which account for this. First the port of Honolulu became recognized in very early days as by far the best harbour in the group before the dredging of Pearl harbour. The use of this port as a base by whalers, and as a point for the export of sandalwood before that, brought to the island large numbers of traders, ship chandlers and other commercial men. The growth of the city was augmented by a steady stream of imported labourers released from their indentures, who gravitated into the town to seek their fortunes. But the planters imported still more labour. The plantations thus became indirectly a recruiting ground for the city. To-day about 40 % of the people of the territory live in Honolulu itself. The second factor explaining the disproportionate density of population in Oahu is the use of Pearl harbour. Once it was decided to develop the naval base there, urban settlements surrounding the harbour developed rapidly, and large numbers of people are to-day employed supplying the wants of the armed forces.

Parallel development to that of Honolulu occurred at Hilo, the second largest town in the territory with a population of about 19,000 inhabitants, and also, on a much smaller scale, in the smaller ports of the other islands.

Growth of Population

Census Terms for Elements of the Population

For census purposes the people of Hawaii are classified as Hawaiians, part-Hawaiians, Chinese, Japanese, Filipinos, Portuguese, Spanish and 'Other Caucasians'. The part-Hawaiians are divided into Caucasian-Hawaiians and Asiatic-Hawaiians. The clumsy term 'Other Caucasians' is used to designate people of American or northern European ancestry apart from Spanish and Portuguese. Colloquially the Hawaiian word *haole*, meaning simply 'foreigner', is used almost universally to designate 'Other Caucasians' and will be used in this account. The term Caucasian is sometimes used here also to cover all people of European descent.

Each of these various sections of the people is often referred to as a 'racial group', though it does not correspond to a race in a scientific sense. The terms 'ethnic group', based on distinctions in their physical characters, or 'cultural group', based on distinctions in their social characters, are more appropriate according to the topic under discussion.

Relative Growth of the Elements of the Population

Cook estimated the population of Hawaii as about 300,000 in 1778. By the time of the first census of the kingdom of Hawaii in 1853 the number had dropped to about 65,000. Foreigners resident in the island at that time numbered 1,197. They were for the most part English or American. By 1878, two years after the signing of the reciprocity treaty with the United States, the total population had fallen to about 46,000. While the combined Hawaiian, part-Hawaiian, and *haole* population continued to fall slightly, the total population was from that date swelled by increasing numbers of Portuguese, Chinese and Japanese indentured labour, to about 120,000 in 1896, the date of the last census undertaken by the kingdom of Hawaii. Between 1896 and 1900, the date of the first census after annexation, the Japanese had been imported so rapidly that their numbers rose by about 39,000. The planters were evidently anticipating the restrictions on imported Oriental labour which were to be expected as a result of union with the United States. Since 1900 the population has risen steadily, being augmented from outside after 1910 by Filipino labourers and especially after 1920 by American immigrants.

To-day the original Polynesians, thinned out by disease and the dislocation caused by the impact of western civilization, are still

declining. This is due primarily to the intermarriage of pure-blooded Hawaiians with the members of the other numerous groups who have settled in the islands. The part-Hawaiian stock is flourishing. The Portuguese and Japanese, owing largely to the favourable terms under which they were brought in and to the favourable ratio of women to men, have both multiplied, while the Chinese and the Filipinos, who came with far fewer women, have in some cases married Hawaiian women. Many have returned home, or else, especially in the case of the Chinese, their children born in the islands and therefore eligible for United States citizenship, have emigrated to the mainland of America. There has not for this reason been such a great increase in the numbers of these groups. In the case of the Filipinos there has actually been a decline of about 10,000 in the last 10 years. The *haole*, that is to say British, Americans and northern Europeans, generally have increased, not so much by reason of a high birth-rate, but because of additional immigration by Americans, the politically and economically dominant stock. The graph showing the growth of population in the islands (Fig. 98) is largely self-explanatory. The rather sharp increase in the Caucasian figures between 1930 and 1940 is in part accounted for by the increase in the military and naval forces stationed in the territory.

At the present time the largest single element in the Territory is the Japanese, who form rather more than a third of the whole population. The Caucasians, including both *haole* and Portuguese, accounted for 21·8 % in 1930 and 26 % in 1938. The Chinese, who have not increased greatly since 1900, account for only 7 %. Filipinos amount to about 13 %.

Changes in population, 1930–8

Census classification	1930		1938		Difference	
	No.	% of whole	No.	% of whole	No.	% of whole
Japanese	139,631	37·9	153,539	37·3	+13,908	−0·6
Caucasian	80,373	21·8	106,999	26·0	+26,626	+4·2
Hawaiian and part-Hawaiian	50,860	13·8	62,135	15·0	+11,275	+1·2
Filipino	63,052	17·1	52,810	12·8	−10,242	−4·3
Chinese	27,129	7·4	28,380	6·9	+ 1,251	−0·5
Korean	6,461	1·7	6,707	1·6	+ 246	−0·1
Others	780	0·2	915	0·2	+ 135	+0·01

Based on *Annual Reports of the Governor of Hawaii to the Secretary of the Interior*, p. 5 (Washington, 1938).

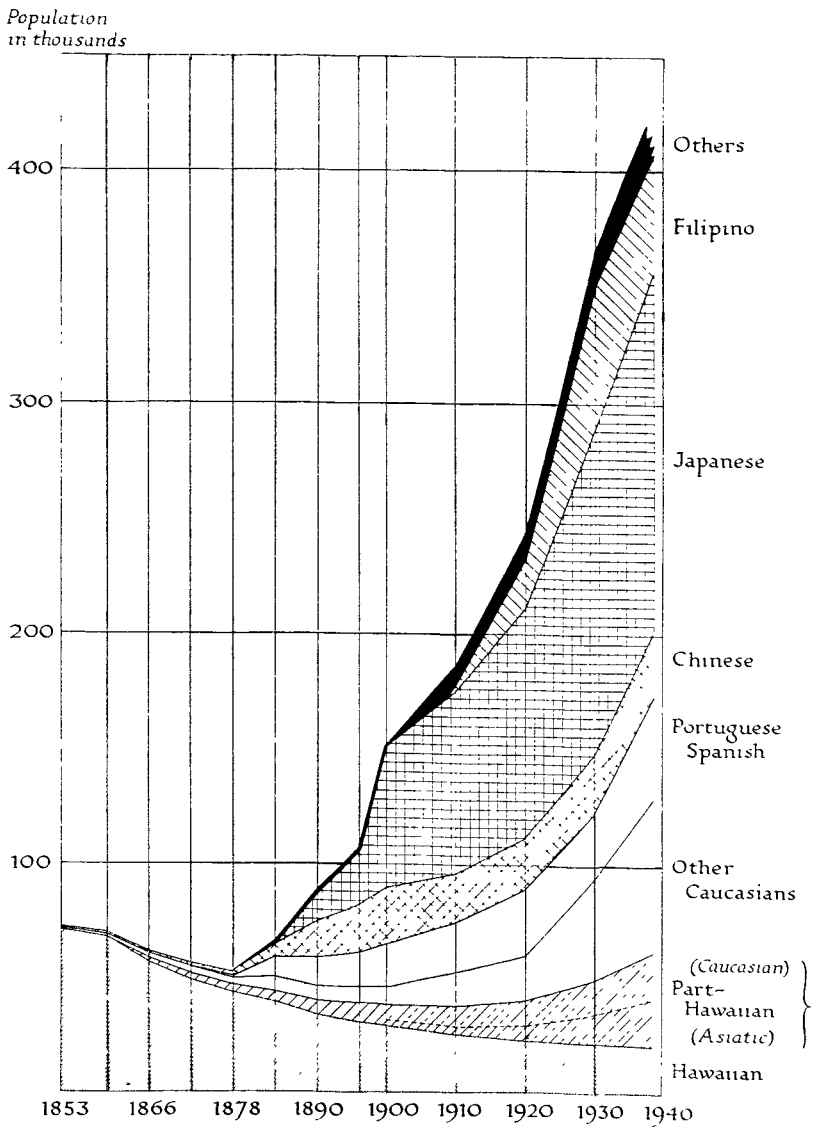


Fig. 98. Growth of population of the Hawaiian islands, 1853–1939

Six-year census periods of the Kingdom of Hawaii have been used till 1896, and ten-year census periods of the United States after 1900. Based on: (1) Romanzo Adams, *The Peoples of Hawaii*, p. 10 (Honolulu, 1933); (2) *Annual Reports of the Governor of Hawaii to the Secretary of the Interior, passim* (Washington, 1933–40).

Since there has been a virtual ban on all Asiatic immigration, except Filipino, any increase of these peoples is a natural biological expansion.

The decline in the Filipinos is an indication of a decline in plantation agriculture and increased mechanization. As their contracts expire many return home and others are not being brought in to replace them because marginal areas are being converted to small farms which are settled by people of other races.

Birth-Rates and Death-Rates

In 1930 the birth-rate for the whole territory was 19·6 per 1,000, and the death-rate 10·8 per 1,000. In 1939 the birth-rate had risen to 21·9, and the death-rate had fallen to 7·8.

Among the various ethnic groups according to census classification the crude birth-rates in 1932 and crude death-rates in 1930 were:

Ethnic group (census classification)	1932 Births per 1,000	1930 Deaths per 1,000
Hawaiian and part-Hawaiian	38·9	21·1
Portuguese	33·9	9·1
Other Caucasian (*haole*)	14·1	7·7
Chinese	24·6	11·8
Japanese	30·5	8·3
Korean	23·1	12·5
Filipino	20·9	10·9

Based on Andrew W. Lind, *An Island Community*, pp. 111, 113 (Chicago, 1938).

The principal features of these figures are the very high birth- and death-rate among the Hawaiians, and the high birth-rate among the Portuguese. Contrary to popular belief the Japanese birth-rate while high is less than that of either the Hawaiians or the Portuguese. On the other hand, the Japanese death-rate is remarkably low. This may be explained by emigration of Japanese with qualifications for American citizenship to the United States.

Age and Sex Distribution

Comparative birth- and death-rate statistics do not give a true picture of the position of different elements of the population. A group with large numbers of its members over 60 would show a higher death-rate than one composed entirely of recent immigrants who would probably

not be over 40 years of age. A true picture of the situation demands some analysis of sex and age distribution of the various elements.

Fig. 99 shows the age and sex distribution among four selected ethnic groups, 'Other Caucasian', Caucasian-Hawaiian, Japanese and Filipino. Each group is shown by a 'cone' or 'pyramid' with a layer to represent the population for each five years of their age. The percentage in each age group is shown by the distance which the layer extends from the axis of the cone. Males are shown on the left, females on the right. Naturally the cone tends to be wider near the base and decreases with the higher age groups.

The cone for the mixed Caucasian-Hawaiian group shows a practically equal number of men and women in every age group. The percentage of children under 14 years of age is exceptionally high in comparison with that of the older people, denoting both high birth-rate and high death-rate, but suggesting a rapid potential expansion of this stock.

In strong contrast to the symmetrical cone of the Caucasian-Hawaiians are the cones of the *haole* and the Filipinos. Both groups show a very large excess of males between the ages of 20 and 35. This is accounted for in the case of the *haole* ('Other Caucasians') by the garrison of the island and by naval personnel at Pearl harbour, many of whom are in the territory for a short time only, and are unmarried or have left their wives on the mainland of the United States.

The excess of Filipino males over females between these ages is due to the fact that most Filipinos come to the territory as short-term imported labourers with the intention of returning home on the expiry of their contract. It is noticeable when comparing these two cones that in proportion to the number of women between the ages of 20 and 40, the Filipino children are far more numerous than among the *haole*. The low *haole* birth-rate is due to their high standard of living, which almost invariably seems to bring with it an artificial restriction of the birth-rate.

The Japanese cone shows a slight excess of males over 45 years old, while those under 45 are far less than would be expected at first sight. The explanation is that for two or three decades before 1900 the Japanese supplied most of the immigrant labour, but after 1904 Japanese immigration virtually ceased. The Japanese population below about the age of 40 represents children born to the Japanese in the island, who in spite of favourable treaty regulations of immigration and the system of 'picture brides', suffered slightly from the same handicap of too few women as the Filipinos do to-day.

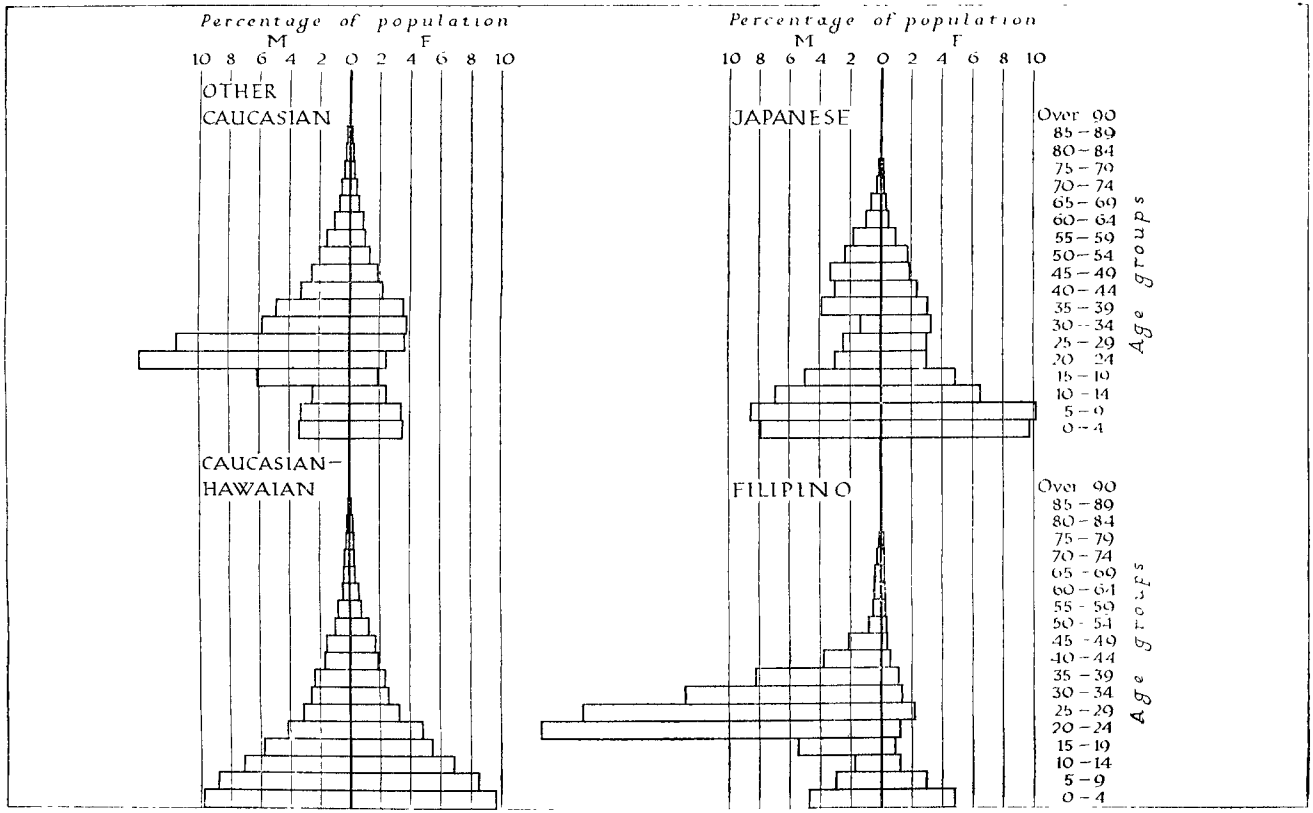


Fig. 99. Age and sex distribution in four ethnic groups in the Territory of Hawaii, 1930

Based on Andrew W. Lind, *An Island Community*, p. 122 (Chicago, 1938).

Sex distribution for the other ethnic groups tends to be uniform, like that of the Caucasian-Hawaiian group, but the percentage of young children tends to be less, showing that with the exception of the groups considered specifically, the population has a fairly low birth-rate, but that the age and sex distributions are well balanced and that a slight but uniform expansion may be expected.

PEOPLES

The Native Hawaiians in Former Times

The people whom Captain Cook found inhabiting the Hawaiian islands in 1778 were a branch of the widespread Polynesian group.

Physical Appearance

Tall of stature (about 5 ft. 9 in. in average height) and well built, with a skin colour of a light brown, they had black and straight or wavy hair, and dark eyes. Their noses were large and broad, but not excessively so, their lips were slightly thicker than those of Europeans. Their foreheads were high, though sometimes narrow in proportion to the height of the head. Measurements from living Hawaiians indicate that the average cephalic index for men is 83·4, and for women 84·26. These figures give the Hawaiians slightly broader heads than the Samoans and the Marquesans, who resemble them more closely than other Polynesians. A characteristic though not particularly noticeable feature, as with all Polynesian peoples, was that the angle of the jaw between the vertical and the horizontal portions of the bone tended to be curved gently, while in most other races the jaw is marked by a sharp angle at this point. Except perhaps in colouring the Hawaiians resembled south-western Europeans fairly closely.

These characters may still be seen in the Hawaiian and part-Hawaiian population, though with the large amount of miscegenation that has taken place they are not necessarily found in any one individual.

Ancient Culture

Social Structure. Socially the ancient Hawaiians could be divided into two main classes, the nobles (*alii*) and the common people, with a priesthood forming a body apart. Before the unification of the group each island or large district was ruled by a high chief or overlord who, enjoying services and tribute from the other *alii* who owed

him allegiance, often waged war against his neighbours. Land was held on a feudal basis. In general, the major division, known as *ahupua*, which was the principal unit allotted to each chief, was a narrow stretch of land running inland from the water's edge for many miles. Thus a grant of land would contain unirrigated uplands, forests, a water supply and marshy grounds for taro patches. It was divided by natural boundaries which usually followed the drainage pattern as nearly as possible.

There was no tribal organization, but family relationships were important. Descent was in the male line, but the rank and genealogy of women were important from the point of view of general social status. There was no written language but traditions were passed on verbally, and the nobles could recite their genealogies for as much as twenty-three generations.

Religion. The religion of the Hawaiians was complex. They held in veneration a pantheon of gods or culture heroes, most important of whom were Ku, Kane, Kanaloa and Lono. All these deities occurred in slightly modified form in other parts of Polynesia. Combined with the worship of these beings was a form of worship of the spirits of natural forces or objects such as Pele, the goddess of fire, symbolized in Hawaii by volcanoes. Even trees had their particular tutelary spirit who had to be propitiated before a tree was cut down to make a canoe.

Intimately connected with their religion was the system of taboo. This may be described as a series of supernatural sanctions which regulated conduct. Actions which broke the rules were supposed to produce supernatural reactions, evidenced by the sickness of the offender, a mishap to him or even death. The system therefore became a means of enforcing law and custom.

Food. Though their social organization was of a comparatively high order, the culture of the Hawaiians was essentially a stone age one. They lived largely by planting taro in marshy ground at the estuaries of the rivers, and by fishing. Their other foods were sweet potatoes, bananas, breadfruit, coconuts, also dogs and a certain amount of poultry. Living as they did largely on the coasts and in the river valleys, they had cultivated practically all the land suitable for their simple form of agriculture, and, faced with an over-population problem, had practised abortion and infanticide. By these means they were able to limit their population to the resources of the island and to live a life of comparative plenty. This no doubt contributed largely to the open-handed, generous and friendly character of the

people and was to make them an easy prey to land-hungry settlers in the early days of European and American expansion in the Pacific.

Sea-going Tradition. A chief characteristic of the Hawaiians, however, was their boldness and skill as navigators. The ethnological evidence suggests that the islands were peopled from Tahiti about 2,300 miles to the south, and from the Marshall and Gilbert islands a similar distance to the south-west, and there are many accounts of voyages to and from Tahiti in the Hawaiian traditions. While the great age of Polynesian migration and exploring had ceased by the time of Captain Cook's discovery of the group in 1778, they were still primarily a sea-faring people. The crew of the *Resolution* were impressed with the number of canoes they saw in Kealakekua bay, estimating them at rather more than 3,000.

The larger vessels used on sea-going voyages were double canoes consisting of two dug-out hulls, of which the sides had been raised by washstrakes, joined together by varying numbers of transverse beams. The length of the craft varied considerably, but seldom exceeded about 60 ft. The beam of each hull was not much greater than 18 in. The two hulls were spaced about 2 or 3 ft. apart, and a narrow deck was built upon the beams joining the two hulls. In heavy weather they covered the open portions of the hull with matting to keep out spray. They carried a single mast stepped well forward, and between the two hulls. The sail was roughly triangular in shape with its apex downward. As an alternative means of propulsion, paddles were used. Early drawings show crews of as many as twenty paddlers with an equal number of passengers sitting on the deck between the two hulls, but for long voyages the complement would obviously be much smaller than this.

Fishing canoes were single-hull vessels with a thin outrigger float to starboard supported on two curved booms. The construction of the hulls was roughly similar to those of the larger sea-going canoes, but they did not carry sail. The sea-going tradition survives to-day. Many Hawaiians earn a living as fishermen or sailors.

Modern Cultural Conditions in the Territory

One of the most marked features in the life of the Hawaiian islands is the intimacy of association of groups of people of diverse cultural origins, and the rapidity with which the processes of assimilation have gone on. In the popular phrase, Hawaii has been 'the melting-pot of the Pacific'. At the same time the changes in the cultural life have

rested very largely on economic foundations. To understand present conditions, therefore, it is necessary to consider how the land is held, and how the various sections of the people are occupied.

Land Tenure

The impact of European settlers and a money economy led to complications in the old Hawaiian system of land holding, until King Kamehameha III reapportioned all lands in his kingdom in 1848. The land was divided into three categories: government land, royal demesne, and land for the chiefs, who held it as their entire property. Many of the chiefs alienated their land to settlers, while the missionaries, too, who had obtained great influence in the kingdom, acquired large tracts of land for their own, apart from the land obtained for churches and mission activities. European and American capital followed the settlement, and plantations for the growth of sugar played an important part in the alienation of land and the establishment of the economic dominance of the foreigner. After the revolution the government land and royal demesne became vested in the republic, and ultimately, when the islands were annexed, in the Territory of Hawaii. As such it is administered by the Public Lands Committee. With exceptions such as national parks or forestry reserves, it may be leased, and small areas may be sold, while certain regions have been allotted to the Hawaiian Homes Commission.

The extent to which alienation has proceeded is clearly seen by the following table.

Per capita assessed value in dollars of real estate by 'races', Territory of Hawaii

	1911	1920	1930
Hawaiian and part-Hawaiian	286·7	376·3	468·9
Portuguese	105·8	236·3	522·6
'Other Caucasian' (*haole*)	1,003·7	2001·4	2,123·8
Chinese	40·8	176·2	570·3
Japanese	2·6	9·2	92·3
Filipino	—	—	1·7

Based on Andrew W. Lind, *An Island Community*, p. 267 (Chicago, 1938).

The comparatively large value of land held by Hawaiians is accounted for by the fact that large areas owned by chiefs have been leased to plantations; but the ordinary people have few opportunities of acquiring any. Chinese and Japanese, as farm land becomes avail-

able, are usually in a position to invest in it. The Filipinos, who are the most recent arrivals, have not been able to establish holdings of any size.

Occupations and 'Racial' Groups

The occupational distribution of the immigrant peoples is governed by two factors. The early arrivals, finding an open and expanding market, occupied the best positions, while the later comers found their opportunities more and more restricted. The other factor is an apparent national aptitude for certain occupations. Thus the Chinese very largely predominate in the retail trade; the Japanese compete with them to some extent but predominate in the artisan or mechanic class, and as drivers of motor vehicles, and occupy the most important position in the fishing industry.

Few of the immigrants who have come to work on the plantations have been content to remain there after their contracts have expired. There has been a constant drift into the towns, more especially Honolulu, of ambitious labourers and their children, who have been educated to a standard of life which is far above that of the parents. While numbers of labourers have returned to their native land, and a few have remained on the plantations, where they live to-day as pensioners or doing light work, for the vast majority of the immigrants the plantation has been a stepping stone to a more congenial and more lucrative occupation. As a labour investigator in 1915 remarked: 'no race worth bringing to the islands would be content to remain permanently at the end of a hoe.' The planters have been compelled to import a steady stream of immigrants. Each group in turn has made its contribution to the population of Honolulu and the industries therein. The speed of this movement has no doubt been augmented by the desire of the planters always to have a moderate surplus of available labour.

The economic conditions of the 'thirties, however, with their limitation on the sugar and pineapple markets, and the general saturation of the labour market, have combined with the restriction of immigrants to check the drift into the towns, and unemployment on a small scale has recently encouraged a return to the land. The proportions of people engaged in the major occupations in 1930 are seen in Fig. 100.

No particular occupation can be regarded as the exclusive preserve of any one ethnic group. But with the predominance of agriculture is correlated a lack of opportunity for advancement, in industrial or

professional pursuits, and this increases the keenness of the competition. The advantage in this competition lies with the people of American and northern European origin.

Haole (*Americans and Northern Europeans*). By virtue of their early arrival and membership of the politically dominant group, the *haole* are well established in the more lucrative positions. Of the owners and managers of sugar plantations 32 % are descendants of the early American missionaries or related to them by marriage. According to the United States census of 1930, out of 2,225 men following

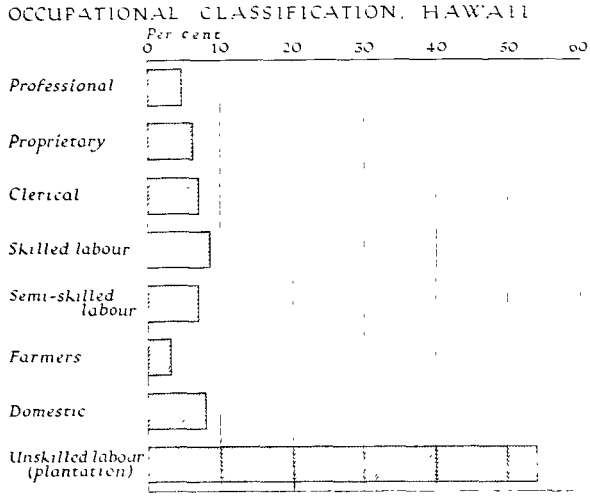


Fig. 100. Occupational classification in the Territory of Hawaii, 1930
Based on Andrew W. Lind, *An Island Community*, p. 249 (Chicago, 1938).

occupations of one kind or another, 1,072 were of 'Other Caucasian' descent. This represents very nearly half the total, although the proportion of 'Other Caucasians' in the territory was roughly only a seventh of the whole population of the islands. The real economic power, however, is in the hands of the 'factors', or commercial agents.

To-day there are five large firms of factors, who virtually control all capital and large-scale business in the territory (they are American Factors, C. C. Brewer and Co., Alexander and Baldwin, Castle and Cooke, and T. H. Davies and Co.). There are also four minor firms. Starting as small traders, the factors, with the declining trade with the whalers and surplus capital in their hands, invested this money

in the plantations, and at the same time acted as middlemen in the marketing of the crop and the purchase of machinery for the refining plants. Plantation activity requires a heavy outlay of capital with the prospect of slow returns; this capital the plantation owners were unable to provide. Thus it was that they were willing to part with a measure of control to the factors.

Other occupations in which Americans and northern Europeans are to be found are the transport organizations, retail shopkeeping, and the mechanical arts. But out of a total of about 21,000 artisans, builders, electricians, mechanics and so on, rather less than 10 % are classed as 'Other Caucasians'. In the railways, tramway company and inter-island steamship company roughly 9,300 men are employed, of which about 14 % are 'Other Caucasians', mostly in a managing capacity.

Hawaiians. The pure Hawaiians, who are declining, and the part-Hawaiians, who are increasing, are spread through most walks of life. On the plantations, about 1,300 men are engaged as labourers, roughly 2,000 hold appointments as managers or overseers, and about 900 men are tenant farmers or own the land they work. Roughly 3,000 Hawaiians live as isolated farmers planting taro, or living on subsistence farming in the remoter parts of the territory. Others have been resettled on the land under the Hawaiian homesteading scheme of 1921 (see p. 355). About 2,100 men are actively engaged as mechanics or artisans and dockers; 500 are in government employment, especially as policemen, for which occupation they seem particularly well adapted, and about 400 men, mostly of mixed Hawaiian blood, are engaged in clerical occupations. In the professions small numbers have become doctors or barristers. In politics, to which they are well adapted by their friendly spirit and rhetorical traditions, several have been returned to the territorial legislature or elected as delegate to the United States House of Representatives.

Other Groups. The Portuguese have been slow to leave the plantations. Roughly 2,000 are still engaged in the sugar industry in various capacities. Others have undertaken work of various kinds in Honolulu as artisans, shopkeepers, dockers, policemen, and so on. Only about 500 have risen into the professions.

The Chinese have sought all kinds of employment on leaving the plantations and only about 700 are still employed in the production of sugar. They make their greatest mark as shopkeepers. Roughly a quarter of the retail traders in the territory are Chinese.

The Japanese are still employed in moderate numbers on the plantations, but have found work as mechanics, dockers, fishermen

and tailors. As shopkeepers they are even more in evidence than the Chinese. Proportionately few have found their way into the professions.

Out of a total Filipino population of about 52,000, some 36,000 were employed in the sugar industry alone. In fact, they provide the great bulk of unskilled labour on all the plantations. A number are dockers and a few are to be found in most occupations.

Settlement and Housing

The even temperature and mild climate reduce the number and cost of the necessaries of life. Social activities are mostly open-air affairs, and housing is therefore only needed to sleep and sometimes eat in. Thus it is that while the hotels, business and government buildings and the houses of the well-to-do American population are well-built stone or brick structures, the houses of the poorer people of all kinds in the towns and on the plantations are simple wooden structures of the bungalow type, often on one floor, with wide verandahs shaded by overhanging roofs. No elaborate arrangements need be made for heating. In fact, the only need to burn fuel is for heating water and cooking. There are adequate supplies of water and electric light in the large towns and on most plantations, where electricity is usually generated by the plantation and supplied free to labourers. Many houses do not even have glazed windows but rely on blinds to keep out the rain. This is no great hardship, since the temperature indoors and out of doors is about the same.

The general pattern of settlement has been determined by the history of the territory, the geographical environment and the nature of the occupations of the people. Oahu is by far the most densely populated island, and the city of Honolulu is the only really large city in the territory (p. 392). Apart from Honolulu and Hilo, and the small towns of Wailuku and Lihue, which are administrative centres, the towns and villages of the islands are first and foremost plantation settlements, or small coastal holiday resorts catering for the tourist trade. The average plantation settlement or village has its mill with the houses of the workers and plantation officials grouped round about it. A club or assembly room, a few shops, a church, a hospital, playing fields and perhaps a small power station complete the town. Such settlements are usually private property, administered by the plantations, and should only be visited with the permission of the appropriate plantation authorities. The practice of treating the public on these lands as trespassers was adopted by the plantation managers

to exclude agitators who came into the settlements to foment strikes. The coastal resorts and small ports usually have a small hotel, some facilities for amusement and a few shops (cf. Individual Islands, Chapter X).

General Social Conditions

Wages and Expenditure. The complicated make-up of the population no less than the great differences of wealth between the proprietary classes and the labourers on the plantations and the mixed population of the larger towns make it very difficult to generalize on the standard of living. While the average wage rates are only about half those in the United States, the standard of living is probably higher. Housing accommodation is cheaper, or even free in the case of the plantations. Clothing requirements are less and a large proportion of family income is spent on wireless sets, motor-cars and so on. There was, for example, in 1940, one motor-car to every sixth person in the territory.

Diet. The early indentured labourers brought with them their traditional diets, but the younger generation, educated to American standards, have adopted a European diet. Partly owing to tradition and partly because of the price of fresh vegetables there is a tendency for cereals, of which rice is the most important, to predominate. This is to some extent mitigated to-day by the growing of cabbages, potatoes and carrots on homesteads and market gardens, and by the cultivation of taro.

Recreation. Facilities for amusement and recreation include cinemas in the towns and playing fields on the plantations. Every plantation settlement has its playing field and social club with various indoor games. The principal games played are baseball, basket ball, football, and tennis. A system of inter-plantation matches is a regular feature of plantation life.

Religion

As a result of the early missionary activity the whole of the native Hawaiian population are Christian. Most are Protestants. The Portuguese, Porto Ricans and some Hawaiians are Roman Catholics. In matters of religion, as in everything else, the Japanese have resisted the impact of western ideas with more success than any other racial group, and while a few are professed Christians the majority are Shintoists and Buddhists. In all there were in 1940 137 Japanese Buddhist and Shinto priests, 67 Buddhist temples and 259 Shinto shrines.

Clubs and Societies

It has frequently been said with some truth that 'Big Business' is controlled by the descendants of the missionaries. In the face of commercial organization and close family ties of the richer American population there has been little combination on trade-union lines (see p. 379), but there have been numerous racial associations on apparently non-political lines among the Chinese and even more among the Japanese. Among the Chinese these take the form of family associations, or associations of immigrants from a particular village or district in China. They are mostly social and formed for sentimental reasons.

The Japanese merchants and shopkeepers in Honolulu have formed a Japanese Chamber of Commerce, and in every town or village there are small Japanese clubs. In Honolulu are two large bodies—the United Japanese Societies of Honolulu, and the Japanese Civic Association. The former co-ordinates the activities of many smaller bodies and generally determines the policy and activities of the Japanese communities. The latter is avowedly non-political and non-sectarian and co-operates with public welfare bodies. Another, the Japanese Educational Association, a centralized body controlling the Japanese language schools, is perhaps the greatest single factor preventing the normal assimilation of the Hawaiian-born Japanese population.

Education as a Factor in Assimilation

Though drawn from many sources and differing in character in many ways, the various elements forming the population have been drawn together by employment in common tasks and by numerous social contacts.

Perhaps the greatest single factor in welding them together is a common education (p. 352). Some indication of the degree to which this assimilation has progressed among the various elements is shown by the accompanying table showing the percentages of each racial group unable to speak English:

Percentage of Racial Groups unable to speak English in 1930

Racial group	%	Racial group	%
'Other Caucasians' (*haole*)	0·2	Porto-Ricans	21·0
Caucasian-Hawaiians	0·6	Koreans	24·5
Asiatic-Hawaiians	0·8	Japanese	29·8
Portuguese	5·1	Chinese	22·4
Hawaiians	8·3	Filipinos	59·0
Spanish	11·2	Others	4·8

Based on U.S. Bureau of Census, 1930.

This shows that only among the Filipinos can less than half of the population speak English. Although assimilation among the other Oriental peoples, who have been established much longer in the territory, has gone further, progress has not been by any means complete.

Race Relations

Relations between the different races are, in general, friendly and co-operative. The common system of education has gone a long way to produce this effect. There is no colour bar and little other specific discrimination. The fact that representatives of some of the immigrant groups have found their way into the professional occupations at the top of the social scale has gone some way towards eliminating feeling among the later immigrants that certain professional and other occupations are barred to them. But some justification for this feeling can be found in the occupational distribution of the various groups and in the concentration of economic power in the hands of the firms of factors. Important factors militating against complete assimilation of the many groups in the territory are the increased economic competition in the higher walks of life, and the exclusiveness of certain groups, notably the Japanese. Some light may be thrown on the attitude of the Japanese towards their neighbours by consideration of the institution of dual citizenship. While all Japanese born in the Territory of Hawaii are claimed as American citizens, they may also be registered at the Japanese consulate as Japanese subjects. In 1926, 3,645 children were so registered out of a total number of Japanese births for the year of 5,024. But in 1939 only 797 were so registered. The number of parents wishing their children to retain Japanese citizenship, and therefore with pro-Japanese sympathies, is presumably declining, but the large numbers of Japanese owing allegiance both to the United States and to Japan has apparently caused some anxiety in Hawaii.

Miscegenation

Mixing of the races is certainly increasing. The factor most conducive to such miscegenation is the tolerant and friendly attitude of the Hawaiians. There are to-day nearly twice as many Caucasian-Hawaiians and Asiatic-Hawaiians in the territory as pure Hawaiians. They mate easily with white, and to a lesser extent with the Asiatic peoples, and may well be the cement by which a virtually new race will be bound together.

Details of all marriages in the territory are shown for the years 1912–13 and 1931–2 (Figs. 101, 102). Naturally most marriages were among people of the same ethnic group. 'Out marriages' or marriages with peoples of different groups tend to be most common among the Hawaiians and part-Hawaiians, fairly common among the Portuguese and other Caucasians, and rare among the Asiatics. The percentage of endogamous and exogamous marriages for the men of the principal ethnic groups are shown below:

Percentage of Marriages, 1932

	Within the group	Outside the group
Hawaiian	45	55
Caucasian-Hawaiian	43	57
Asiatic-Hawaiian	27	73
Portuguese	68	32
'Other Caucasian'	61	39
Chinese	76·5	23·5
Japanese	96	4
Filipino	71	29

Based on Romanzo Adams, *The Peoples of Hawaii*, pp. 31, 32 (Honolulu, 1933).

Twenty years earlier the Chinese were 'marrying out' far more frequently. But the gradual levelling of the sex ratio has produced more endogamous marriages and suggests that shortage of women rather than any particular lack of racial solidarity was the primary factor. The Japanese, with the advantage of a better sex ratio than the Chinese, have always shown a greater solidarity than any other group in the islands.

Politics

Franchise. Since all men and women born in the Territory are citizens and, provided they are over 21, are entitled to vote, the electorate is a very mixed body. Naturally those groups most fully represented are those of from 25 to 30 years' standing in the islands, and whose children therefore have reached the voting age. The only group which is not fully represented is the Filipino. Filipinos arrived in numbers only since about 1910, and coming largely without women have not married so frequently. They form the bulk of the lowest stratum of society, the labour on the plantations. There is, therefore, a greater fear that they, being largely without an adequate voice in the government, will be more prone to create industrial disturbances than those peoples who can at least make their feelings

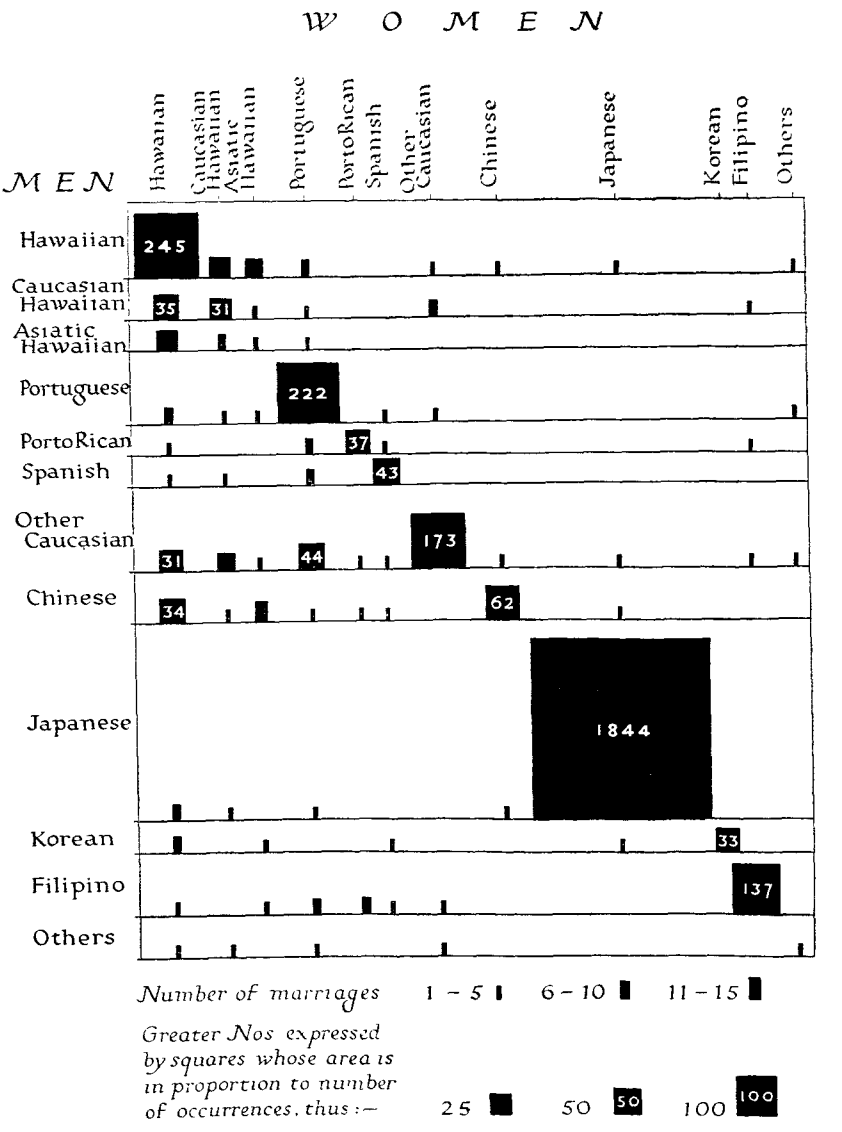


Fig. 101. 'Interracial' marriages, Territory of Hawaii, 1912–13

From any rectangle in the diagram the ethnic classification of husbands can be read horizontally, and that of wives vertically. Based on Romanzo Adams, *The Peoples of Hawaii*, pp. 31, 32 (Honolulu, 1933).

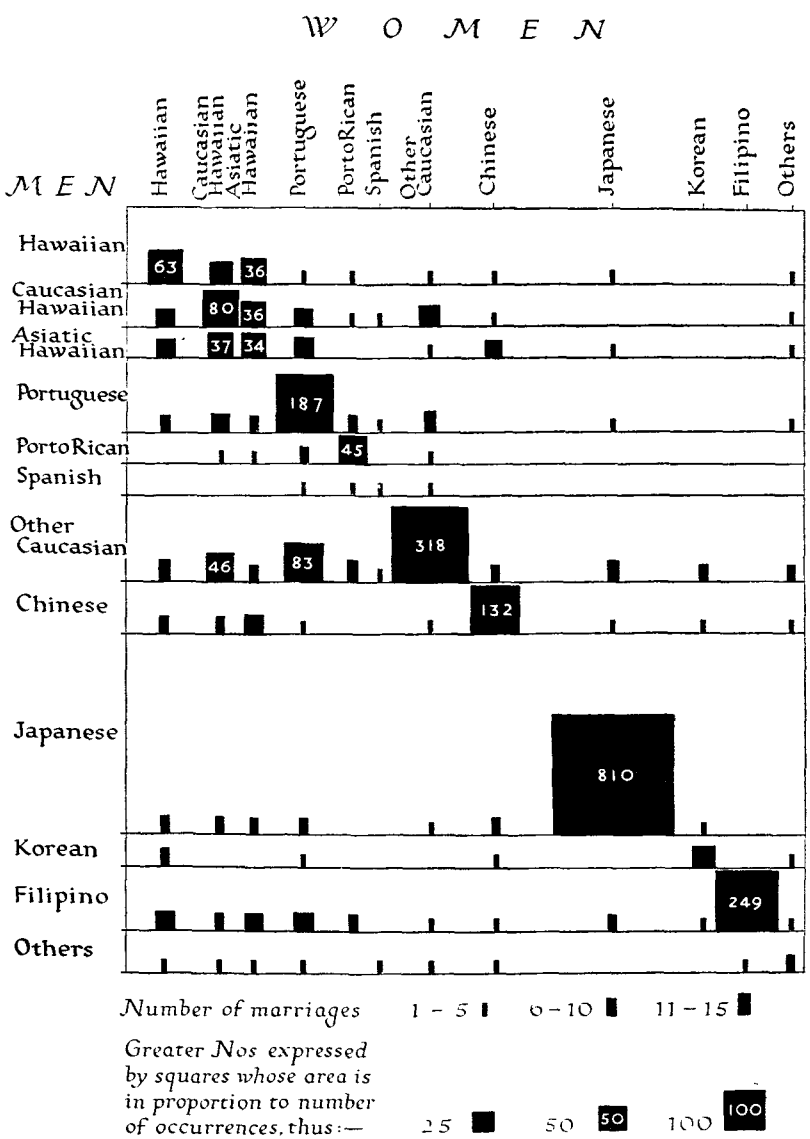


Fig. 102. 'Interracial' marriages, Territory of Hawaii, 1931–2

For explanation and source see Fig. 101.

heard through political channels. While in the past there has been a certain amount of discrimination against the Asiatic voter by charging him a fee for a birth certificate to prove his citizenship, the policy, initiated in 1922, of accepting a statement of the Board of Health as evidence of birth in the Territory is generally accepted. With the growing political strength of the Oriental vote, the county clerks, who act as the returning officers, may be more lenient.

Political Candidates and Racial Voting. Candidates for the legislature or the local governments are of most ethnic groups. The Hawaiians and 'Other Caucasians' predominate, but in general there has not been a very strong 'racial' vote. As far as Hawaiians and 'Other Caucasians' are concerned, the division of votes has tended to be on the lines of the two parties into which the territory is organized—Republican, right wing; and Democratic, left wing. Chinese have been elected to the legislature on occasions, and they have attracted many more votes than the total Chinese electorate. The Portuguese are indiscriminate in distributing their votes, but there are signs that the Japanese do tend to vote on a more strictly 'racial' basis. This tendency is in keeping with the exclusiveness which they show in their matrimonial alliances. In 1932, Japanese Republican candidates obtained seats in the legislature in three areas which were predominantly Republican on the strength of the party label which proved stronger than 'racial' ties or antipathies.

Party Organization. The two parties in the territory represent different economic interests. The Republicans or conservatives represent large-scale business which is predominantly *haole*, being composed of the plantation interests, factors, transport and public utility companies. The bourgeois vote of the ranches and small traders is also consistently Republican. The Democratic party, on the other hand, draws its strength from the artisan classes of the towns, especially Honolulu, and the Hawaiian villages. Hawaiians settled on homestead land have shown considerable variability in their voting.

Most writers on Hawaiian affairs, apparently with a Republican bias, characterize the Democrats as discontented people who have not received any of the more lucrative political appointments. Since the Republicans have won almost every election in the territory and given the spoils of office to their supporters, there may be some truth in this. The only probability of a division of parties on 'racial' lines is that the occupational distribution may tend to make the Democrats not only the poor man's party, but also the Asiatic man's party, while

the Republicans remain a rich man's party and become a white man's party. The Democrats have tended to woo the Chinese vote in the past.

Both parties have an elaborate organization based on clubs in each constituency; these send delegates to a convention each year, where matters of party politics are decided and prospective candidates considered. The actual conduct of the campaign is largely in the hands of the party, which levies a contribution from every candidate towards the expenses of the election, and pays such expenses out of party funds. No limit is set to the sum which may be spent during an election, but such expenditure is theoretically restricted to personal expenses, printing and advertisement, stationery and postage, hire of committee rooms and the salaries of a clerk, messengers and watchers at the polling booths; this restriction has never been enforced.

Outstanding Problems. The most frequent and recurring questions in the legislature are claims for statehood and for a redistribution of the electoral districts. The former is raised in the hope of getting better consideration in economic matters from the Federal authorities. It is a variation of the original demand for annexation made by the commercial interests at the end of the nineteenth century when they feared differential treatment in tariff matters and wanted a protected position in the American market. The outcry is usually fanned by some statement made in the mainland, probably in all good faith, that the Hawaiian islands are mostly alien in character. In reply the Hawaiians point out that roughly 80 % of the population, whatever their racial origins may have been, were born in the islands and are therefore citizens. A committee was appointed by Congress to investigate the statehood question in 1938 and recommended deferment of the matter in view of the uncertain international situation. Agitation continued, and in 1940 a plebiscite held in the territory was overwhelmingly in favour of statehood being granted. But no action has been taken. The claim for redistribution of electoral districts is based on the fact that since the original distribution the island of Oahu, and more particularly the city of Honolulu, have increased their population out of all proportion to the remainder of the territory, without adequate political adjustments being made.

ADMINISTRATION AND SOCIAL SERVICES

GOVERNMENT

General. Constitutionally the Territory of Hawaii stands in an anomalous position. It was created an integral part of the United States by the Organic Act of 1900, but is not one of the States of the Union. The framers of the Organic Act regarded Hawaii as a potential State, but fearing the large Oriental population were unwilling to give the islands full equality with the rest of the United States.

Save for the fact that a territory has no say in the election of the President, and the Governor is nominated, not elected, the difference between a state and a territory is more apparent than real. But the legal difference is none the less important. In the relations between a state and the federal government, all powers not specially granted to the federal government by the constitution are inherent in the state. In the territories, however, legal sovereignty in the last resort lies entirely with the federal government in all matters.

The executive consists of a Governor and a Secretary of the Territory (appointed for a four-year period by the President of the United States), and certain officers and boards appointed by the Governor for various but comparatively long periods.

The legislature, elected by and answerable to the enfranchised population of Hawaii, is made up of two houses. The upper house or Senate consists of fifteen members who sit for four years. Continuity in their composition is made by the provision that seven and eight members respectively retire at the end of alternate periods of two years. The House of Representatives consists of thirty members who sit for a period of two years.

Local Government. Owing to the distances involved, the territory is divided into four counties, Kalawao, Maui, Kauai, and Hawaii, to which must be added the 'city and county' of Honolulu. Kalawao is the smallest county, consisting only of that portion of Molokai set aside as a leper colony. Kauai includes the neighbouring island of Niihau. Maui includes the islands of Maui, Lanai, Kahoolawe and Molokai (except the leper colony). Hawaii stands alone. The city and county of Honolulu includes not only the island of Oahu but all the Hawaiian leeward islands. The counties are governed by boards of supervisors of from five to seven members elected for two years, and certain local government officials are appointed under them.

The city government of Honolulu is composed in a similar

manner, but various municipal departments are organized under it on a larger scale than in the counties.

Franchise. The qualifications of a voter in election to the legislature, to the U.S. Congress or to the county councils are that he shall be over twenty-one, a citizen of the United States, be able to speak English, and have resided in the island at least a year prior to the time when he exercises his vote. The Hawaiian and American population obtained American citizenship automatically, when the United States annexed the territory, but the Asiatics did not unless they were born in the island. If born in the island they automatically possess American citizenship, and are entitled to vote. But the legal expenses involved in acquiring a birth certificate amounted to $35, a large sum for a Chinese or Japanese labourer. In the past many have been unable to vote on purely economic grounds. Elections are held in every even year for members of the legislature, the delegate to the United States Congress and for the Honolulu city council, and in odd years for the county councils.

Relationship of Executive and Legislature and Federal Government

The relationship between the executive and the legislature is of necessity a compromise. The Governor and the Secretary are responsible to the President, but the Senate and the House of Representatives are responsible to the electorate. Most appointments to administrative offices made by the Governor must have the assent of the territorial Senate. The Governor has a veto over legislation, and if the legislature is unwilling to authorize the necessary money bills introduced by the Governor he has the power to authorize the treasurer to draw on territorial funds on the basis of the previous budget. Though it has frequently happened that the Senate has not always seen eye to eye with the Governor, moderation has been shown by both parties, and the system seems to have worked adequately and smoothly. In addition to this contact between the territory and the federal organization through the Governor there is another link through a delegate to Congress at Washington. He is elected for a four-year period and may attend sessions of the House of Representatives as an observer, and may speak, but may not vote.

The interwoven system of administration in which the federal, territorial and county authorities participate is complex, and it is difficult to differentiate the precise point at which authority passes from one body to another.

In general, the federal government is responsible for defence,

public health to an appreciable extent, immigration, meteorological services and the geological survey. The Agricultural Experimental Station is a part of the U.S. Department of Agriculture. Before the repeal of the Volstead Act the enforcement of prohibition was also a federal concern. The executive branches of the territorial government include the following departments: the Secretary's Department, Treasury, Public Works Department, Auditor's Department, Attorney-General's Department, Public Lands Department, Public Instruction Department (education) and Survey Department. In addition, there are numerous boards, commissions and committees such as the Board of Agriculture, Assistance Board, Harbour Commissioners, Board of Health, and various library commissions.

Ad hoc committees or boards have been set up to deal with particular aspects of administration as the need has occurred. Some of these are appointed by the Governor; some are elected; some are unpaid; others have a fixed salary laid down by law. There are altogether eighty-five such bodies in the territorial government. Their authority varies and their responsibility is to both Governor and legislature. In some cases they appear to overlap the functions of the federal authorities, in others they appear to do similar work to the county administrations. It is impossible in a short space to give a complete account of all these boards and the precise limits of their functions.

Public Service

The traditional American 'spoils' system evidently did not attain its customary development, largely for two reasons. Almost every election held under the territorial system has returned Republicans in a majority. People already employed in government service were not disturbed by a new party. Equally the process whereby the Governor obtains approval for his appointments from the legislature has tended to maintain a continuous policy. But the number of people of each race in government employment does seem to be susceptible to the relative voting strength of the various races in the island. In 1925 the percentage figures were as follows:

	Hawaiian and part-Hawaiian	Portuguese	*Haole*
Voting strength	48	15	26
Office holders	44	12	30
	Chinese	Japanese	Others
Voting strength	6	5	0
Office holders	6	5	3

Based on R. M. C. Littler, *The Governance of Hawaii*, p. 75 (Stanford University, 1929).

Finance

Territorial revenue is collected from the following main sources: general property tax, poll tax, income tax, licences for motor vehicles, fisheries licences, rents and sales of public land, and the profits from certain departments and public utilities. Subsidies are also granted to the territory for road improvements and other public works. County revenue is also derived from the property tax. The taxes for county expenses are, however, collected by the territorial authorities and reallocated to the counties. Thus taxes which in Great Britain would be classed as rates are treated as a territorial government tax, and since the requirements of each county differ the tax to be levied varies from county to county. In 1928, for example, this tax was collected on a basis of 3·5 % of the assessed value of property for the city and county of Honolulu; and 3·7, 4·1 and 3·5 % for the counties of Maui, Hawaii and Kauai respectively.

Income tax is graded according to income with certain family allowances. Death duties are graded according to the nearness of the relationship of the inheritor and the amount bequeathed.

The total revenue of the territory usually amounts to about 13,000,000 dollars. Of this sum some 6,000,000 dollars are provided by income tax. Poll tax and licences of various kinds each yield rather more than 1,000,000 dollars and the federal government subsidizes the territory to the extent of roughly 2,000,000 dollars annually.

The largest single item of expenditure is for education, which accounts for between 6 and 7 million dollars. Other large items of expenditure are for health, transport services, charities and prisons.

Education

Traditionally in Hawaii, and arising out of the activities of the early missions, there has always been a high standard of education. Schools were established early in the nineteenth century. In the pioneering gold-rush days of the 'forties, the settlers in California sent their children to school in Hawaii, which was more accessible than the schools in New England. It was a choice between the comparatively simple voyage to Honolulu, or the long voyage round the Horn, or the by no means safe route across the continent.

Education Facilities

Education is compulsory for all children between the ages of six and fourteen. There are altogether 188 public schools with a teaching

staff of about 3,300 and about 90,000 children attend them. The majority of these children are Japanese, Chinese, Filipino, Hawaiian, or part-Hawaiian. The American population, who usually belong to the richer strata of society, tend to send their children to private schools of which there are eighty. These are frequently of a denominational character. Hawaiians, too, have their own school founded by the Hawaiian Princess Bernice Pauahi (Mrs Bishop). Of the American private schools the oldest is the Punahau School founded by the missionary Hiram Bingham. St Louis College is a Roman Catholic foundation. Various private kindergartens have been established in the islands.

The teaching staff of the schools is to-day recruited almost entirely from graduates of the University of Hawaii who undertake an extra year's training course after they have obtained their degrees. *Haole* formed 45 % of the teaching staff, Hawaiians and part-Hawaiians 26 %, Portuguese 9 %, Chinese 11 %, and Japanese 7 %.

An institution for higher learning was founded in 1907, under the name of the College of Agricultural and Mechanical Arts, and in 1920 it became known as the University of Hawaii. Degrees may be taken in numerous subjects. Tropical agriculture is perhaps the most important and the most appropriate to the economic organization of the island. Other subjects include Chinese, Japanese and Hawaiian literature. Particularly characteristic, however, and eloquent of the traditional American policy of assimilation by education is a course in 'American institutions' which all undergraduates must take.

Among other important bodies the Hawaiian Academy of Arts combines the functions of art gallery and an art school, and the Bernice Pauahi Bishop Museum, in addition to its function as an ethnological museum, is a most efficient research institution in the natural and social sciences.

Educational Policy and Foreign Language Schools

The particular aims of the education authorities are to educate and assimilate the large numbers of foreign children of the indentured labourers, mostly from China, Japan and the Philippines. Attention is concentrated mostly on the teaching of English. Numerous 'foreign language' schools, principally under Japanese aegis, have incurred disapproval because they hinder the Americanization of the immigrant population. There seems to have been some justification from the American point of view, since the text-books employed in the Japanese schools were for many years the normal Japanese

Government text-books, and the school policy was to preserve and strengthen the ties with Japan.

Responsibility for the organization of education, the arrangement of the curriculum, and the engagement and payment of teachers is vested in a territorial board of six commissioners and a superintendent, all appointed by the Governor. There is thus a uniform and standard educational policy throughout the territory, but the provision and maintenance of school buildings is the responsibility of each county authority. The federal government maintains a general interest; in 1920, for instance, a Commission of the Bureau of Education of the Department of the Interior made a survey of Hawaiian education.

Recent Trends

In recent years criticism has been levelled against the educational system on the grounds that too much money is spent on the programme, and that the type of education tends to produce too many 'white collar' workers when what is needed most is a supply of willing labourers on the plantations. The criticism is a reflex of the economic trends of to-day, the limitation of opportunities in the towns and the reduction in the numbers of imported labour. Hawaii is on the horns of a dilemma. She has imported the cheap labour needed to work her plantations and has determined very laudably that the children of these labourers shall have the opportunity of acquiring as much American culture as possible. But while in times of economic expansion the policy is successful, when restriction of opportunities prevails, difficulties arise.

Steps have been taken lately to encourage a return to the land and to make the education more vocational in character. Classes are now being given in agriculture, trades and industries, commerce, home crafts, etc. There are also certain day, part-time and evening classes for adults in various subjects. In this category is the University Agricultural Extension Scheme, under which people with technical agricultural qualifications visit the farms and homesteads and demonstrate improved methods. By this means they are tending to improve the supply of vegetables for the home market. Up till recently, in spite of the large part of the population engaged in agriculture, Hawaii imported large quantities of tinned or frozen vegetables.

Another function now attached to the school authorities is that of finding employment for their pupils when they leave school. In the past the tendency was to regard education as an end in itself, but the logic of economic pressure has enforced a more practical trend.

Health

The very mixed population, springing from many sources, brought some new diseases to the islands. Early voyagers and traders brought tuberculosis and venereal disease to which the original Polynesian inhabitants, long isolated from infection, succumbed in large numbers. Chinese labourers introduced leprosy, popularly known among the Hawaiians as 'the Chinese disease'. Epidemics of smallpox occurred in 1853, 1872 and 1881, cholera in 1895 and bubonic plague in 1901.

Since Honolulu is the first port of call for vessels plying between Oriental ports and the American mainland, there is considerable risk of ship-borne infection. This risk was augmented in the years immediately preceding 1939 by the occurrence of cholera, smallpox and typhus in the Orient.

To-day, however, with most rigid sanitary regulations, the disease rate is low. In 1939 the five principal causes of death were as follows:

	Total no. of deaths	Rate per 100,000
Diseases of the heart	543	131·4
Pneumonia	308	74·5
Cancer	274	66·3
Tuberculosis	272	65·8
Nephritis	272	65·8

Based on *Annual Reports of the Governor of Hawaii to the Secretary of the Interior*, p. 25 (Washington, 1939).

There were over 2,000 cases of syphilis and gonorrhoea in 1938. Tuberculosis, however, seems to be on the decline. Cases under observation in 1939 were 2,812 as opposed to 3,077 in the previous year and 3,120 in 1937. Most of the deaths occurred among young Hawaiians and Japanese.

Including establishments run by the plantations there are about forty-five hospitals in the territory. The federal public health service maintains a quarantine station and a hospital in Honolulu, and a branch station at Hilo. Frequent examinations of the crews of ships are made. There are three private and seven territorial tuberculosis hospitals. The medical professions—physicians, surgeons, chemists, chiropracters, nurses, etc.—have their own governing bodies which are supervised by the territorial Board of Health.

Leper Colony. The most striking medical activity in the Territory is the organization to deal with lepers. The Board of Hospitals and Settlement administers the arrangements for lepers, including the

Kalaupapa settlement on the north coast of Molokai with about 400 patients, the Kalihi hospital, which is also a receiving station for leper patients in Honolulu, and the Kapiolani Girls' Home (for the non-leprous children of leprous parents).

Formerly the leper colony of Kalaupapa was largely maintained by Roman Catholic priests, of whom Father Damien is perhaps the most famous. To-day, however, adequate doctors and nursing staff live in the settlement.

Public Assistance and Homestead Policy

Relief. Recently unemployment has become a factor of importance in the territory and a system of relief has been introduced. This is characterized by the fact that labourers and other employees make no contribution to the fund, but a levy is made on employers in proportion to the number of men they employ. The scheme is, therefore, non-contributory in the sense in which the term is understood in Britain. The system is in its infancy and up to 1939 the number of unemployed was comparatively small. Up to June 1939 only 2,700 claims for unemployment benefit had been paid under this scheme, but the federal Social Security Board spent $465,000 in relief to 6,000 people in 1940. Assistance is granted by the public welfare board to needy children, and numerous welfare services, mostly of a medical character, are provided in the public schools.

Homesteading. In another category is the policy of 'homesteading', that is to say, establishing people on public lands as small farmers. The early homesteading legislation limited the land to 20 acres per applicant, allowing ten years for payment. The scheme was not particularly successful, because experience showed that the majority of the homesteaders grew sugar or pineapples under contract for the large plantations, and thus became indirectly a part of the labour force working for the large landowning companies. A later 'homesteading' scheme, the Hawaiian Homesteads Act of 1921, was a specific attempt to restore Hawaiians and part-Hawaiians to the land. Approved applicants can lease land for a period of 99 years and borrow money up to $1,500. Unfitted by temperament for commercial enterprises and unwilling to work on the plantations, the poorer Hawaiians had in many cases drifted into the towns where they tended to become a depressed class. This Act, which was intended to remedy the state of affairs, was simply a measure of social justice. In many cases the Hawaiians had sold their lands in the early

days very cheaply to traders and settlers against whom they with their lack of economic knowledge were unable to compete. The scheme has had some success, and in 1939 there were about 2,500 persons on homestead land.

Law, Justice, Police

The legal system of the territory is based on American common law with certain modifications to suit local conditions, notably in regard to land tenure. Every ten years statutes are revised.

The judiciary is divided into a Supreme Court composed of a chief justice and two judges; Circuit Courts at Oahu, Maui, Hawaii and Kauai; District Courts and certain specialized courts such as Tax Appeal Courts, Land Courts, and Juvenile Courts. Six judges for the Supreme Court and the Circuit Courts are appointed for a four-yearly period by the President of the United States, while the judges of the District Courts are appointed for two-yearly periods by the Chief Justice of the territory.

In addition to the territorial courts described above there is a Federal Court sitting in Honolulu with judges appointed for six years.

The District Courts correspond in their jurisdiction to Petty Sessions in this country. The Circuit Courts try both criminal and civil cases and the Supreme Court is a court of appeal. The Federal Court concerns itself primarily with cases concerning federal law. In all courts except the territorial District Courts the normal jury system is employed. The law officer of the territorial government is the Attorney-General, to whom the county attorneys are responsible. Attorneys (barristers) are divided into two categories: those qualified to plead in all the territorial courts, and those only allowed to plead in county courts. The latter are usually Hawaiians and their legal training and qualifications are lower than those of the former.

The Sheriff is responsible for prison administration and is nominally answerable to the Attorney-General. Boards of prison inspectors, parole boards and compensation boards all add to the complex system of administrative functions. There is a small body of federal police, and local police forces are maintained by the counties. The force in Honolulu is about 200 strong, while the total force for the territory in 1930 numbered 371. Of these 242 were Hawaiians or part-Hawaiians, and the remainder mainly Europeans or Americans.

(For bibliographical note see Chapter IX)

Chapter IX

GENERAL REVIEW OF THE HAWAIIAN GROUP (*Cont.*)

Economics: Communications: Ports: Bibliographical Note

ECONOMICS

The Territory of Hawaii is essentially an agricultural area developed by large-scale capitalist enterprise on a plantation basis. But of the total area only about 8·5 % is suitable for cultivation. And in 1938 only 37 % of the food consumed in the territory was produced locally.

The two principal crops, sugar and pineapples, dominate the whole economic life of the islands. Sugar, employing roughly 30 % of the population, is the older of the two industries and is the more important. Coffee and rice, both flourishing industries in former times, are now declining and relatively unimportant. Nearly 2,000 acres are still used for the cultivation of taro. Corn growing and market gardening are minor activities which are assuming greater importance to-day. Fisheries, largely in the hands of the Japanese, are a minor but not unimportant industry employing about 1,700 licensed fishermen. Large areas in the more barren parts of the territory are devoted to stock raising, and the higher slopes have of necessity been set aside as forest reserves to maintain the water supply.

Distribution between Cultivated Land, Pasture and Forest Reserve (1930)

Cultivated land	351,729 acres
Pasture	2,076,347 ,,
Forest reserve	1,021,814 ,,

Source: J. W. Coulter, *Land Utilization in the Hawaiian Islands*, pp. 50–2 (Honolulu, 1933). The table does not include land occupied by towns, roads, etc.

AGRICULTURE

The principal uses of land for agriculture (Figs. 104–109) are as follows:

Principal crops	Acres
Sugar	235,096
Pineapples	78,750
Coffee	5,553
Rice	1,276
Taro	1,651
Cotton	218
Fruits (except pineapples)	3,983
Corn	1,888
Vegetables	4,478
Macadamia nuts	371
Approximate total	333,000

Source: A. W. Lind, *An Island Community*, pp. 317–19 (Chicago, 1938); the figures are for 1935 or 1936, except that for pineapples, which is for 1929.

The use of this land is governed by altitude and by rainfall (Figs. 95, 96). Large areas, which are insufficiently watered by the natural rainfall, especially in Oahu, Kauai and Maui, have been

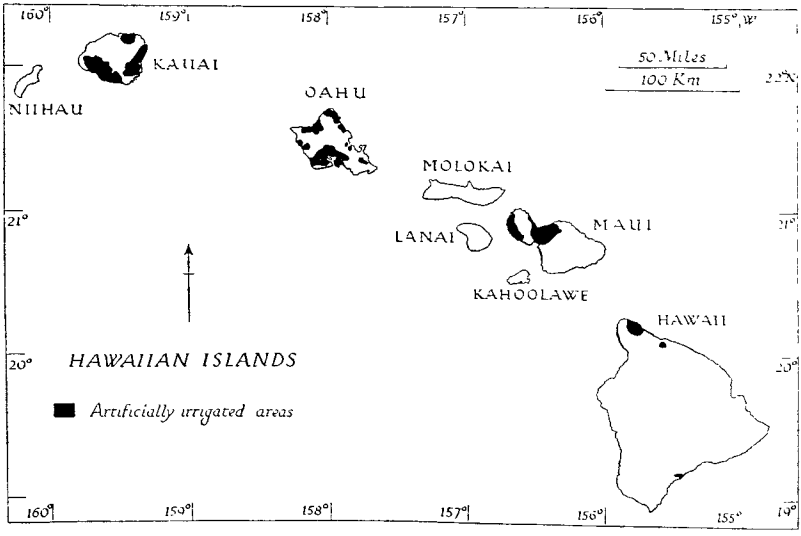


Fig. 103. Artificial irrigation in the Hawaiian islands

Based on Joel B. Cox, 'Water and Hawaiian agriculture', *Paradise of the Pacific*, vol. LIV, no. 4, p. 21 (Honolulu, 1942).

irrigated artificially (Fig. 103) by the sinking of wells or by the construction of long and elaborate pipe-lines. Roughly half the land under sugar cultivation and a large part of the taro and the rice fields are irrigated.

Artificial irrigation in Hawaii

	Area in acres				Average: million gallons per day	Investment in pipe-lines, wells, pumps, power, etc. $
	Sugar	Rice	Taro	Total		
Oahu	44,641	294	831	45,766	537	11,083,908
Kauai	38,384	982	114	39,480	374	5,841,135
Maui	37,125	0	103	37,228	524	11,631,970
Hawaii	10,653	0	118	10,771	136	1,333,885
Total	130,803	1,276	1,166	133,245	1,571	29,890,898

Source: Joel B. Cox, 'Water and Hawaiian agriculture', *Paradise of the Pacific* (Honolulu, April 1942).

Rice and taro are grown in the mouths of river valleys; sugar mostly on ground between 500 and 2,000 ft. above sea level; pineapples in land of similar or slightly greater altitude, but in regions where the rainfall is too small, and the problems of irrigation are too difficult for the successful development of sugar. Pasture is usually found on the higher ground in the drier and more barren parts of the islands. The higher slopes of the mountains are mostly forest reserves.

There are no heavy industries in the territory, but the manufacture of specialized agricultural machinery for use on the sugar plantations has been developed in Honolulu, and a small export trade in this machinery is carried on, principally to the Philippines. The railway companies, relatively insignificant concerns, have their own repair shops. There are numerous sugar mills scattered about on the plantations, and canneries in Honolulu. Most of the canneries are devoted to pineapples, but one is supported by the fisheries and exports canned tuna.

Sugar

The original Polynesian inhabitants of the group were cultivating sugar on a small scale at the time of Captain Cook's discovery, but no attempt was made by them to extract the juice by mechanical means. A Chinese made a crude wooden mill and extracted a small quantity in 1802. The enterprising Spanish agriculturalist, Francisco Marin, included the growing of sugar among his other early experiments, but commercial growing on a plantation basis did not start till 1835.

The first real impetus to the development of this industry came about as a result of the decline of the sandal-wood trade. The opening up of California in the gold rush of 1848 provided a con-

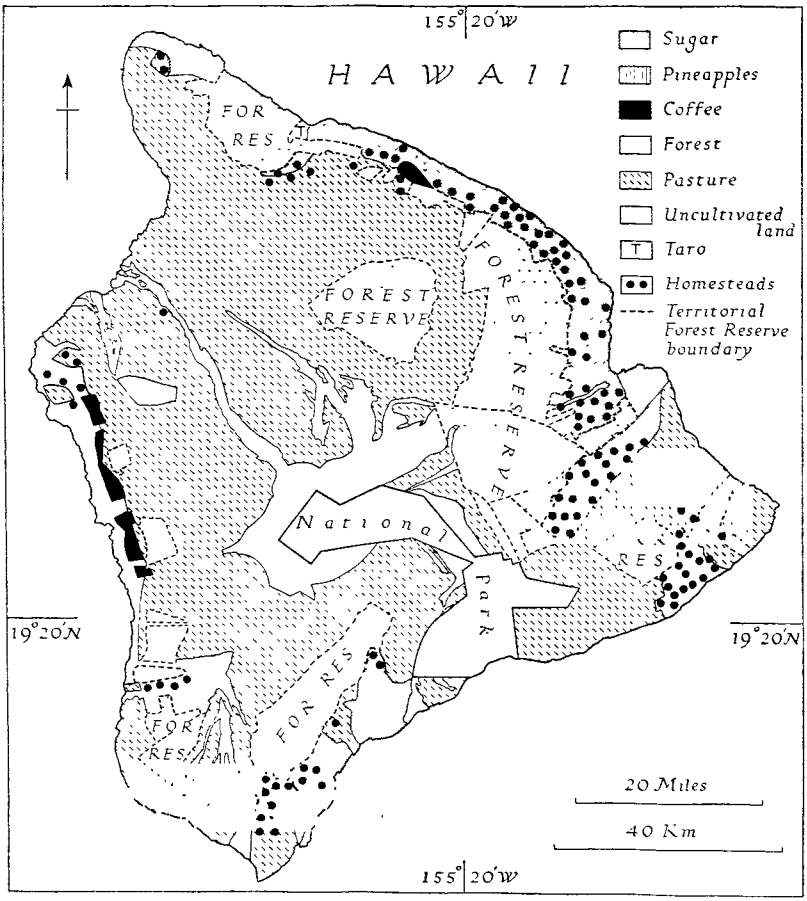


Fig. 104. Hawaii: land utilization

The term 'uncultivated land' includes settlements, waste land and some forest areas not clearly defined as part of an afforestation scheme. Based on J. W. Coulter, *Land Utilization in the Hawaiian Islands*, p. 29 (Honolulu, 1933).

venient market, but for many years the sugar industry was handicapped by the American duty on imported sugar. The reciprocity treaty of 1876, however, providing free access for Hawaiian sugar to the American market, was the turning point in the fortunes of the

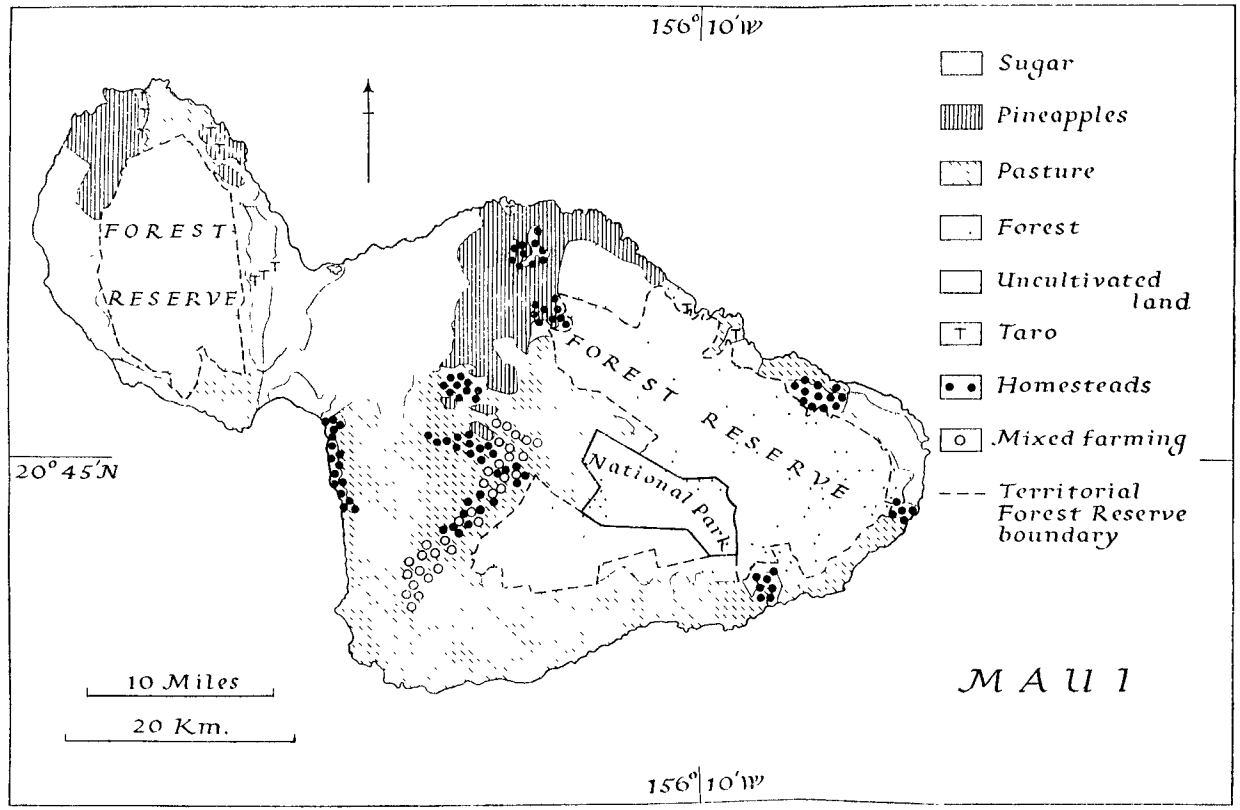


Fig. 105. Maui: land utilization

For note see Fig. 104. Based on J. W. Coulter, *Land Utilization in the Hawaiian Islands*, p. 33 (Honolulu, 1933).

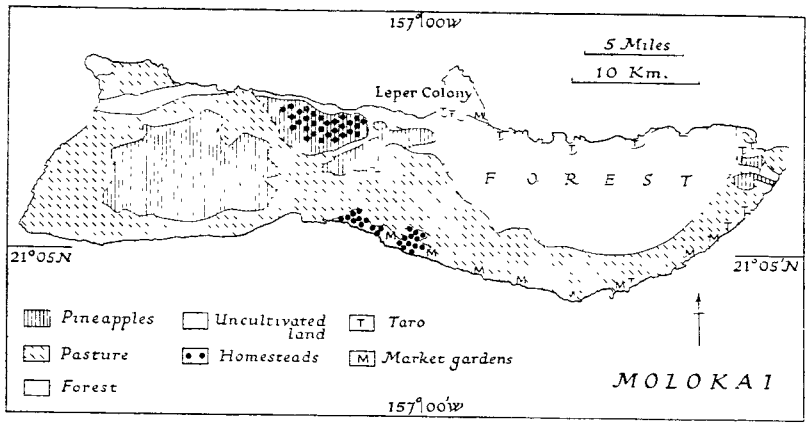


Fig. 106. Molokai: land utilization

For note see Fig. 104. Based on J. W. Coulter, *Land Utilization in the Hawaiian Islands*, p. 35 (Honolulu, 1933).

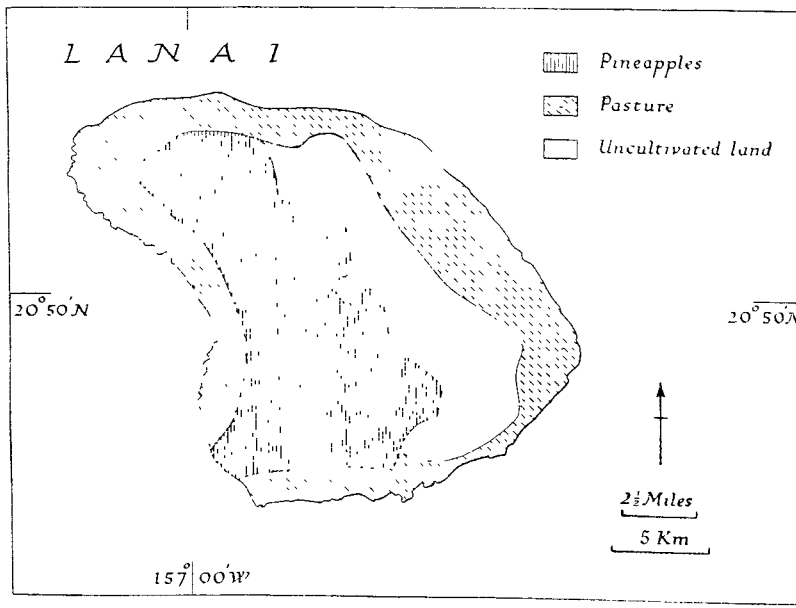


Fig. 107. Lanai: land utilization

For note see Fig. 104. Based on Andrew W. Lind, *An Island Community*, Fig. 7 (Chicago, 1938).

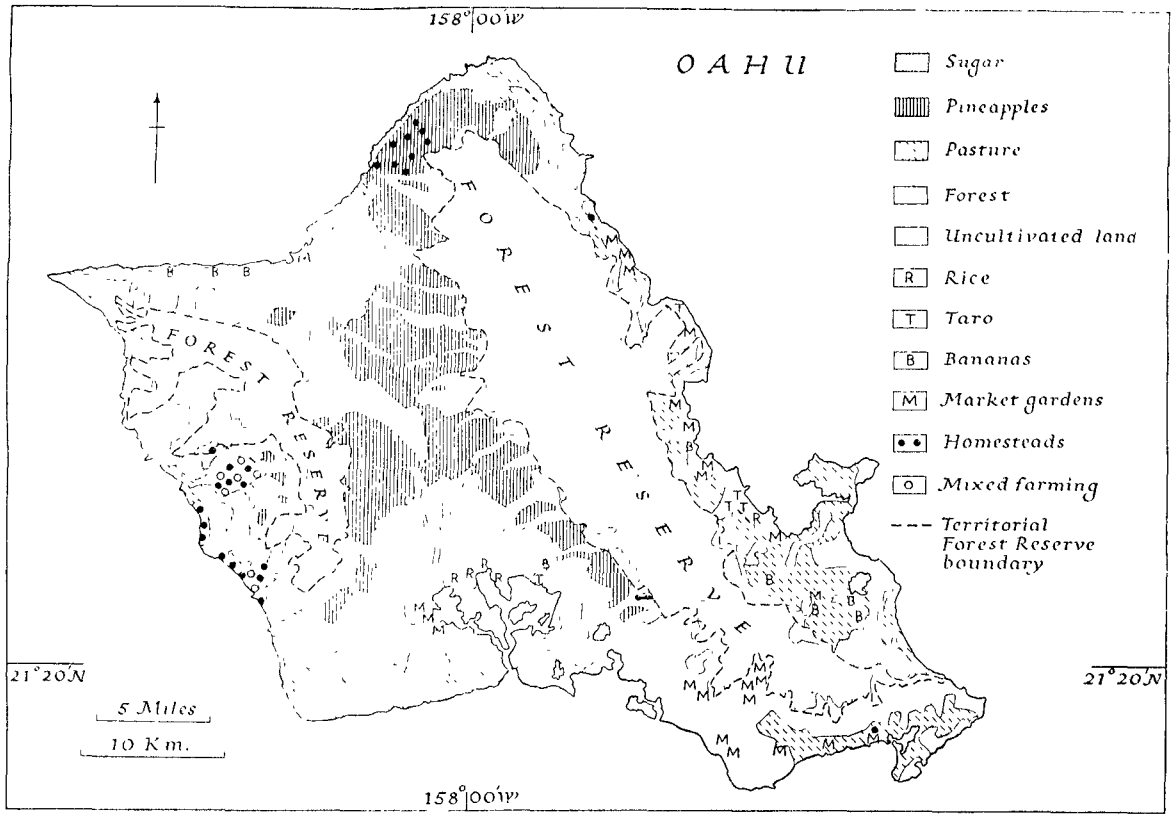


Fig. 108. Oahu: land utilization

For note see Fig. 104. Based on J. W. Coulter, *Land Utilization in the Hawaiian Islands*, p. 37 (Honolulu, 1933).

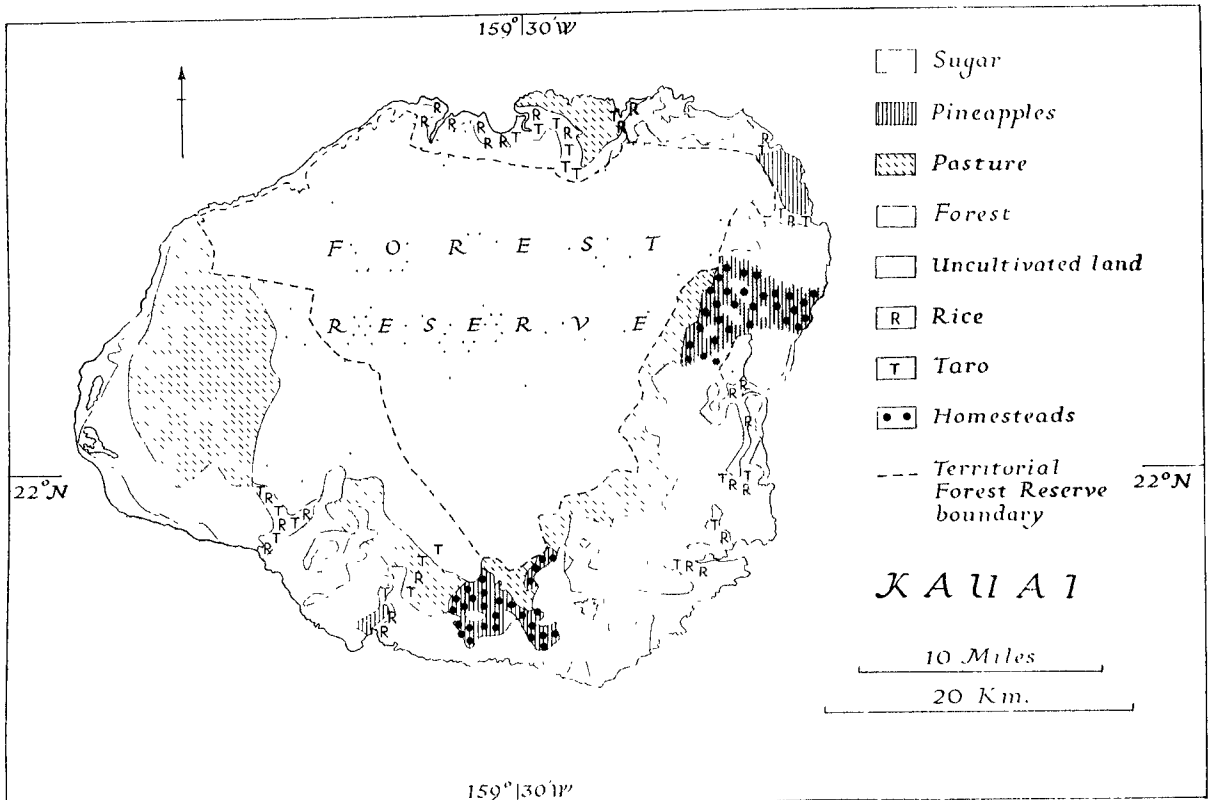


Fig. 109. Kauai: land utilization

For note see Fig 104. Based on J. W. Coulter, *Land Utilization in the Hawaiian Islands*, p. 31 (Honolulu, 1933).

industry. The need for an absolutely safe market in the United States was no doubt an important factor in the events which led to the revolution, and shortly after to the negotiations which ended in annexation in 1898. Even to-day Hawaiian sugar depends on a protected market. Without the existing preference it would be displaced by sugar from Cuban plantations.

Production. Production of sugar (Fig. 110) had increased from about 10,000 tons in the 'seventies to 100,000 tons in the 'nineties, and to 300,000 tons at the beginning of the century. Annual output to-day is little short of 1,000,000 tons, round about which figure it has been

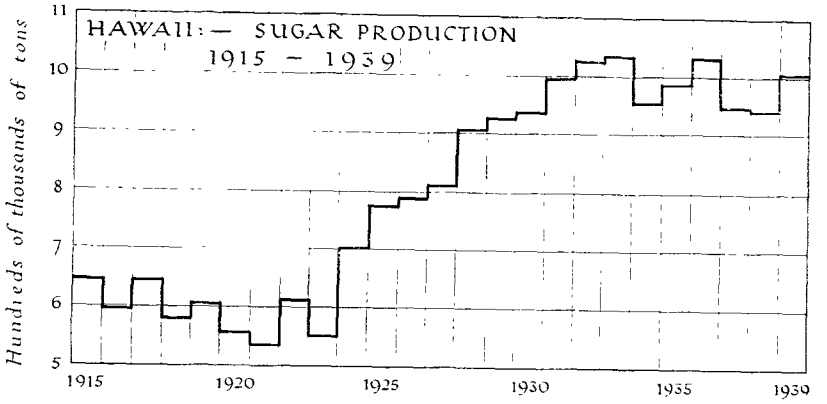


Fig. 110. Sugar production in the Territory of Hawaii, 1915–39

Quantities are expressed in American tons of 2,000 lb. Based on 'Labor in the Territory of Hawaii, 1939', *U.S. Department of Labor, Bulletin* no. 687, p. 12 (Washington, 1940).

restricted by the Jones-Costigan Act of 1934 in order to maintain the price level. This is about 4·7 % of the world's production of cane sugar. The total area planted with sugar rose from 64,149 acres in 1890 to 95,400 acres between 1900 and 1906, and to 252,100 acres in 1933, after which the acreage under sugar has declined slightly. The average yield per acre has risen from 4·3 to 7·2 tons. This higher yield is largely accounted for by the intensive study of soils, insect pests, etc., undertaken by the Hawaiian sugar-growing experimental station, and especially by improvements in irrigation. While the yield per acre on unirrigated land is about 5·5 tons, that on irrigated land averages 8·6 tons. The amount of labour employed has been steadily reduced by mechanization.

Production of Sugar in Relation to Numbers Employed

Year	Tons produced	No. of employees	Tons per head
1882	57,088	10,243	5·6
1892	131,308	20,536	6·4
1902	355,611	42,242	8·4
1912	595,258	47,345	12·6
1924	701,433	43,083	16·3
1932	1,025,354	51,427	19·9

Source: Andrew W. Lind, *An Island Community*, p. 207 (Chicago, 1938).

These figures are not strictly accurate, for since 1920 minors have been excluded from them.

Organization. Although sugar is cultivated primarily on a plantation basis with settlements of immigrant labourers, in some cases small farmers under contract to the sugar plantations, and 'homesteaders', cultivate sugar on their land and sell it to the plantations. In 1939 roughly 13 % of the land under sugar was cultivated by small farmers, who numbered about 3,500.

The general economic organization is analogous to that on the sugar plantations in the Japanese mandated Marianas islands. The major difference lies in the fact that in Hawaii indentured labourers imported into the territory have been of many groups: Chinese, Japanese, Portuguese, Porto Ricans, Koreans, and Filipinos. The Japanese have been able to import labourers of their own stock and thus colonize their islands with a homogeneous population. This the Americans, as a result of the higher standard of living of the average citizen of the United States, have been unable to do.

The choice of regions suitable for the cultivation of sugar (Figs. 104–109) is governed by the need for a temperature of about 70° F. and an abundant water supply. The growth of sugar is inhibited in cooler regions, therefore the majority of the plantations are below about 2,000 ft. They are distributed along the well-watered windward slopes of the island of Hawaii; the wave-cut eastern plain of Kauai; in isolated patches on the east coast of Maui; and in the north and east coast of Oahu. There are further large areas of sugar cultivation on the low irrigated land behind Pearl harbour, and in the west of Kauai.

Technique. The processes of sugar production are very briefly as follows. Irrigation trenches or ditches are laid out. Seed canes, that is to say short cuttings of cane about 8 in. long, are planted and

covered with an inch or two of earth. During growth, which continues for from one to two years, the fields must be hoed and the dead leaves removed from the stalks. After harvesting, when the cane is cut into convenient 8 ft. lengths, it is transported to the mill.

Carriage from the fields to the mills varies with the terrain. Wherever possible narrow-gauge railways are used. In other places flumes (waterways down which the cane is floated) (Plate 65) or everhead ropeways are used.

By far the greatest item in the cost of production of sugar is the labour. For this reason, before harvesting but after the tops have been cut off for seed, the leaves are burnt off. The juice in the cane prevents the stalks being burnt, and any small loss resulting from fire is saved by the reduction in labour costs.

The juice from the cane is extracted in the mills, where the cane is passed between series of rollers. The refuse is used for fuel in the boilers and for making wall boarding or other purposes. The juice is drained off from the rollers, slaked lime is added to precipitate a muddy residue, and the remainder is converted by a process of evaporation into syrup. After this it is crystallized and separated in a rotary cage from the uncrystallized liquid which becomes molasses. The later refining process is usually done in California.

Pineapples

The date of introduction of pineapples into Hawaii is uncertain, but as early as 1813 Francisco Marin had made attempts to grow them. For many years there was a casual sale to whalers, but no serious attempt was made to cultivate the fruit on a plantation basis until 1880. The early experiments were frequently disastrous, and it was not till after annexation in 1898 that a steady and expanding market in America led to the growth of the industry. A cannery, afterwards removed to Honolulu, was established at Wahiawa, but the variability of the fruit and the difficulties of canning at that time made the export of fresh fruit the major concern of the industry. From 1901 till the depression of 1931 the history of pineapple growing and canning has been one of constant expansion checked periodically by over-production. In 1931, a peak year of pineapple production, the output of the canneries was 12,800,000 cases, but this was reduced by the slump of 1932 to about 5,000,000 cases. Output has fluctuated since. In 1937 the figure was 13,200,000 cases, but in 1938 it fell to 8,000,000 (Fig. 111).

Since Hawaii now produces about 80 % of the world's crop of pineapples, there has been little competition to fear from other fields. There is, however, an interesting correlation between the number of tins of pineapples sold and the size of the peach crop in California. A large peach crop tends to decrease the consumption of pineapples in the United States.

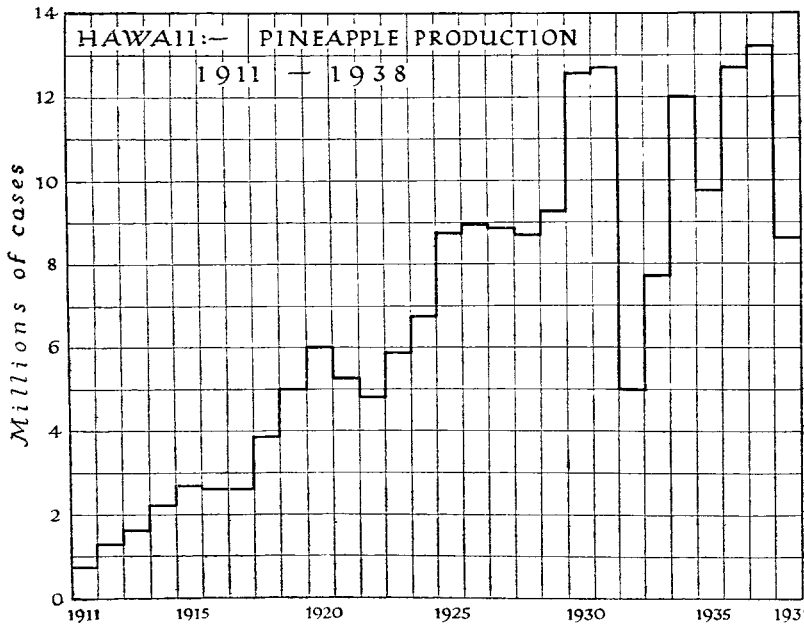


Fig. 111. Pineapple production in the Territory of Hawaii, 1911–38

The estimated average weight of a case is 45 lb. Based on: (1) J. W. Coulter, *Land Utilization in the Hawaiian Islands*, p. 93 (Honolulu, 1933); (2) 'Labor in the Territory of Hawaii', *U.S. Department of Labor, Bulletin* no. 687, p. 84 (Washington, 1940).

Organization. The seven leading companies have pooled their resources in a cartel, the Pineapple Producers Co-operative Association, agreeing not only to the limitation of their output but also to a pooling of resources and to a policy of selling their combined output through a common marketing committee. Large areas have been abandoned as a result of this policy. Part remains fallow in the hope of future expansion; part has reverted to grazing; part has been converted to potato and vegetable growing. It has been estimated that if all suitable land were cultivated production would rise to

about 20,000,000 cases, about four times the restricted output of 1932.

Pineapple growing is a comparatively recent industry and as such has developed on land not already occupied by sugar plantations (Plate 67). But pineapples will grow with far less water than sugar will, and the plantations can thus be established on less favourable land without heavy expenditure on irrigation. If necessary they can be grown successfully at a height of 3,000 ft. above sea level, but most plantations are in regions between 500 and 1,700 ft. which are too dry for sugar. Now no pineapples are grown on the island of Hawaii, where most of the land was already occupied by other industries before pineapples were introduced. In Oahu there is a large pineapple-growing district on the land between the Koolau and Waianae mountains. On the islands of Maui and Molokai and particularly Lanai, large areas formerly given over to grazing land have been planted. The total area of land under pineapples in 1930 before the abandonment of certain areas was about 79,000 acres.

Seasonal fluctuation of labour demand. The labour and harvesting problems of pineapple growing differ considerably from those of sugar. The majority of the crop ripens between June and September, when large labour supplies are required not only in the plantations but also in the canneries. Fortunately this period is one of light work on the sugar plantations, and numbers of labourers migrate temporarily from the one industry to the other. During the slack period, February to May, a reverse process takes place. But many labourers who find no place for themselves on the sugar plantations seek temporary employment on the coffee farms, as casual labourers, or even migrate to the mainland of the United States. The canneries employ as casual workers many women, and boys and girls of school age who regard holiday work in the canneries as a means of earning pocket money.

Mechanization has now proceeded a long way, especially in canning. The 'Ginaca' machine invented in 1913 which peels and cores pineapples mechanically at the rate of about a quintal a minute is perhaps the most important. This and other devices have tended to smooth out the large seasonal fluctuation of labour in the canneries. In 1921 successful experiments were carried out with 'mulching paper'. A tarred paper is laid out in wide strips. Apart from conserving moisture this tends to keep down weeds to a minimum, and so reduces labour needed on the plantations (Plate 66). A 'gassing' process has been developed to accelerate the ripening of some fruit

with a view to spreading the harvesting period. The method employed is to inject a solution of acetylene or ethylene into the heart of the plants some six months before the time fruit is required for harvesting. This technique limits the size of the pineapple but simplifies labour problems. Further experiments are being conducted to retard ripening so that the harvest can be spread over an even longer period, and the seasonal demand for labour reduced still further.

Coffee

The early history of coffee in Hawaii is obscure. The first record of coffee planting is attributed to that enterprising Spaniard Don Francisco Marin. He first planted coffee in 1817. Various subsequent attempts to grow coffee ended in failure, and it was not till 1845 that the first Hawaiian coffee was exported, a consignment of about 250 lb. A coffee blight and the greater profits to be gained from sugar planting combined to restrict the growth of coffee for many years, and several coffee-growing regions were even converted to sugar planting. The industry survived, however, and in 1860, 49,000 pounds were exported, mostly to the United States. This figure rose in 1870 to 415,000 lb.

An abortive attempt to grow coffee on a plantation basis was made between 1890 and 1900 in the hope that it would attract a large body of *haole* to settle in the islands, and in 1898, the year of annexation, 13,947 acres were used for producing coffee on the four major islands of the group. The competition of Brazilian coffee, which entered the American market duty free, was very severe, and after many lean years the plantations were either abandoned or divided up into small farms or homesteads. By 1918 only about 5,000 acres remained, principally in the Kona district of Hawaii (Fig. 104) on land unsuitable for sugar growing.

The white owners or tenants were gradually succeeded by Japanese from the sugar plantations. The following table shows the 'racial' origin of the coffee farmers in the Kona district of Hawaii in 1932.

Japanese	959
Filipino	58
Hawaiian	20
Porto Rican	20
Korean	10
Portuguese	10
Total	1,077

Source: J. W. Coulter, *Land Utilization in the Hawaiian Islands*, p. 113 (Honolulu, 1933).

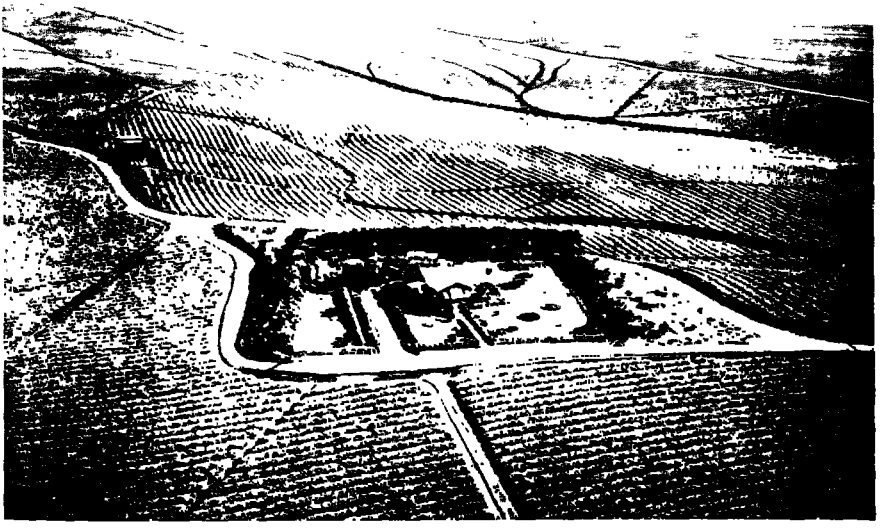


Plate 67. Pineapple plantation (seen from the air)

The pattern is produced by the rows of pineapple plants set in their mulching paper. An idea is given of the great extent of one of these plantations.



Plate 68. Rice fields on Kauai

Rice is grown on flat land near the mouths of rivers, where irrigation is easy. The photograph shows the sheets of water lying on the fields. The hills in the background are typical of the rugged landscape of Kauai.



Plate 69. Taro plots on Maui

Taro cultivation has survived to some extent the breakdown of the ancient Polynesian economy. It is an example of smallholder agriculture which contrasts strongly with the sugar and pineapple plantations.



Plate 70. Fishing sampans in Waiakea creek, Hilo

Small fishing craft of this type were introduced by the Japanese. Larger vessels of similar type, mostly based on Honolulu, are capable of remaining at sea for several days.

Cotton

Cotton is raised in small quantities, but the crop is a very minor one. In 1930 only 172 acres were cultivated, and by 1936 only a slight increase in the area sown had taken place.

Most of the cotton was sold locally to Japanese who used it in 'batten' form as a filling for quilts. A certain amount has been shipped in the past to Japan, but the American market was till recently closed to Hawaiian cotton by quarantine regulations.

These have been necessitated by the presence of the pink boll-weevil, an insect pest which attacks cotton plants.

Rice

The cultivation of rice (Figs. 108, 109) owes its introduction in the islands to the Chinese. Rice growing was the first method they adopted of finding a livelihood when they had completed their indentures on the sugar plantations. Within six years of the arrival of the first indentured labourers in 1852, Chinese were taking over or reclaiming taro patches for rice cultivation. For many years the industry was profitable and large alluvial areas on Oahu, Hawaii and Kauai were devoted to this crop. The work was almost entirely in the hands of the Chinese until 1905, when the competition of the Californian rice made itself felt. After this date the industry declined steadily in value and importance. Contributory factors were the decreasing number of the older Chinese who preferred the rice grown in Hawaii to imported rice, the increase in the number of Japanese who preferred Japanese rice, and the conservative methods of production employed.

As the margin of profit in rice cultivation declined, the Japanese tended to supersede the Chinese on the rice farms, while the Chinese, who still retained the mills, tended to take up retail trading or other activities. By 1932, 711 acres were cultivated by Japanese and 415 by Chinese, making a total of 1,126 acres in all. This land was all situated in the valleys of rivers; most of these were in Kauai (Plate 68).

This small area under cultivation survives the competition of Californian rice only because the small shopkeepers of Kauai are willing from sentimental motives to give a disguised subsidy to the farmers by paying more for home-grown rice than for Californian rice while selling both at the same price.

The method of cultivation adopted was introduced by the Chinese. Seeds are planted in specially prepared seed beds which are kept

damp but not flooded. When the shoots are 6 in. high or more they are transplanted by hand to the fields which have been prepared by ploughing, and flooding to a depth of some 2 in. The level of water is raised as the plants grow and the fields must be kept weeded constantly to remove the wild rice. Before harvesting the fields are drained and then the rice is cut and left in piles to dry. Threshing is by the primitive method of allowing horses to trample it on the threshing floor. Winnowing is performed by hand. The mixed rice and chaff are placed in a basket tray and thrown in the air. The wind blows away the chaff, while the heavier and more compact rice grains fall back into the basket.

Taro

Taro, which is the traditional staple food of the original population, is still grown by scattered remnants of Hawaiians. Most is grown in the wet alluvial lands at the mouths of the rivers. On terraces higher upstream, which are occasionally used, water is diverted into the higher patches, whence it descends to the lower patches, which are divided from it by well-pounded and puddled earth walls (Plate 69). A little taro is also grown unirrigated in the interior. The usual taro patch varies from a few hundred square feet to fields about a quarter of an acre in area. Essentially grown for the local market, this crop may well survive and even increase, since some people in all groups are acquiring a taste for it and there is a general agitation for the development of crops of all kinds which will tend to make the islands self-supporting. At present only about 1,500 acres are so planted, compared with the very large area in the eighteenth century. Recently the taro fields have suffered from plagues of crayfish, but many of these have been killed by the application of a benzine emulsion.

Rubber

Spasmodic attempts to produce rubber occurred between 1893 and 1905. After that date a serious attempt was made by the territorial authorities to encourage the industry by exempting from taxation all property directly associated with the production of rubber. The *Euphorbia lorifolia*, which is indigenous to Hawaii, yields rubber. Other types, mainly Brazilian *Hevea*, were imported. In 1906 a small experimental area was planted in Kauai. In 1908 some 400,000 trees were also planted in the Kona district of Hawaii and 1,300 on the windward side of Maui. By 1910 there were in the territory about

430,000 trees occupying 5,599 acres. Between 1908 and 1915 the average annual production was round about 3,000 lb., varying between a maximum of 7,938 lb. in 1910 and a minimum of 560 lb. in 1911. But the cost of production was too high for economic competition with Malayan rubber, and after the war of 1914–18 production virtually ceased. Since the entry of the United States into the war, vigorous attempts have been made to obtain rubber from the surviving untended trees, tapping them to exhaustion.

Cattle Raising and Dairy Farming

The breeding of stock, whether sheep, cattle or horses, has long been an important industry in the Territory of Hawaii. The interest in stock began when King Kamehameha placed a taboo on the killing of pigs and cattle introduced by early European voyagers. These beasts, free at first from all restrictions and roaming at will, did considerable damage to the vegetation and later had to be restrained. But the growth of the whaling industry created a demand for meat which was met by the establishment of ranches in most of the islands. Ranching does not compete with the dominant sugar industry either for land or labour. The land used is relatively barren, mostly in the interior where there is insufficient water for pineapples or at altitudes above about 3,000 ft., where the temperature is too low for the economic production of sugar. The Hawaiians, who are unable or unwilling to undertake the arduous and monotonous work on the plantations, make willing herdsmen. Thus ranching is to-day in the hands of *haole* owners, the descendants of the enterprising white settlers of the 'fifties and 'sixties, with Hawaiian employees. In 1930 more than two million acres, or almost half the area of the territory, were devoted to grazing. Of this amount nearly 1,400,000 acres were in the island of Hawaii. The largest single ranch has as many as 30,000 head of cattle, mostly Herefords. Several other ranches support as many as 3,000.

Dairy farming has developed lately. American education and environment have taught the Asiatic population to appreciate the value of milk, especially in the towns. There are in all about 10,000 dairy cattle in the islands to-day.

In spite of the large proportion of the territory devoted to ranching and of the fact that about 5 % of the total agricultural income is derived from cattle, roughly a quarter of the meat supplies of the island are imported from California. This is due in part to the variable rainfall. It is impossible to breed to the full capacity of the ranches

for fear of drought. Large quantities of hay and other cattle food are imported into the territory to supplement the grazing on some of the poorer ground. Formerly the difficulty of transporting cattle to the principal centres of consumption limited the amount available. In many places cattle had to be driven into the sea and towed out to vessels offshore where they were hoisted on board by derricks. It is probable now that the highway system, improved by money from federal grants, has gone some way to mitigate this difficulty. Suggestions have been made that larger herds could be raised by feeding them partly on an artificial feeding stuff made from molasses and *bagasse*. *Bagasse* is the crushed remnant of the sugar cane after the juice has been extracted by rollers.

Below are particulars of livestock in the territory according to the American census of 1930:

Domestic animals	On ranches and farms	Not on ranches and farms
Horses	12,030	3,767
Mules	7,975	1,023
Asses and burros	8,878	553
Cattle	138,316	3,602
Sheep and lambs	32,137	119
Pigs	30,563	12,278

Other Agricultural Pursuits

In spite of the very favourable climate, fruit growing apart from pineapples is very insignificant. The fruits include citrus fruits, papayas and bananas. Nuts, grown to some extent, are mostly of one species, the *Macadamia ternifolia*, introduced from Australia. Altogether about 2,500 acres or 1·4 % of the cultivated land are devoted to these crops, which are only grown to meet a local demand. The usual sites for fruit planting are on fields marginal to the sugar plantations, where they serve the purpose of supplying part of the food demands of the labourers, and in the neighbourhood of the towns.

The growing of mixed crops, particularly in the form of market gardening, is developing in the islands of Hawaii and Oahu. Carrots are now being grown both at sea level and in the highlands. The environment should be very favourable, and indeed it is possible to grow three crops of cabbages in the same year on a given patch of ground. Potatoes are now being grown in larger numbers. A small quantity of new potatoes harvested in February and March is even exported to America, where there is a market for them before the

crops raised in southern California and Texas are ready. Soya beans are grown on about 400 acres of land by Japanese, mostly for local consumption.

Since the depression of 1930–1 attention in the islands has been devoted more and more to the production of mixed crops with a view to making the territory more self-supporting. Since 1938 federal quarantine regulations have been modified to admit papayas, avocados and other fruits formerly excluded.

The difficulties of the market gardeners, like those of the cattle raisers, are the isolated and scattered nature of their land and the cost of transport to Honolulu. Another factor of importance is the number of insect pests. The even temperature without a cold winter encourages the insects, many of which attack the crops, to breed throughout the year. Three bodies are working on the problem of insect pest control—the Sugar Planters Association, the Extension Service of the University of Hawaii and a department of the territorial government.

Forestry

Roughly one-quarter of the territory, or about one million acres, is reserved for forestry either in the form of government forest reserves or as land privately forested by sugar planters and others. Koa wood (*Acacia koa*), which resembles mahogany, is the most valuable timber and is used locally for cabinet making. The paper-bark tree and eucalyptus are used in large quantities for fence posts.

But the real importance of the Hawaiian forests is in the conservation of water and the prevention of soil erosion, either by water action or as the result of high winds. On grazing land this is prevented by the planting of shrubs and grasses, and of trees to act as windbreaks. In 1931 the Governor stated in his report that the forested area was barely sufficient to preserve the water supply. In that year trees were being planted at a rate of about 28,000 per month. Active planting on the forest reserves has since taken place. Tree planting for preservation purposes continued to be a major factor in the economic policy of the territory, but there seems to have been a falling off in the rate of this work in recent years. In 1936 trees were planted on 5,406 acres, in 1937 on 4,007 acres, and in 1938 on 3,835 acres.

The areas set aside as forest include most of the land in the larger islands above 2,000 ft., but also small patches of ground reaching the coast in some places (Figs. 104–109).

Fisheries

In the whole territory roughly 1,700 men are engaged in fishing. In the island of Oahu about 250 small craft, mostly based on Honolulu, are employed in this task (Plate 70). Of the men employed as fishermen rather more than 800 are Japanese, while about 360 are Hawaiian. Economic conditions are inducing other groups to take an interest in fishing. The staple catch is tuna (tunny) which is classified locally into two kinds, *aku* and *ahi*. In 1940 the total catch amounted to 19,403,249 lb. Of this quantity 11,000,000 lb. were canned in a factory near the Kewalo basin, east of the town. The remainder, together with other fish of many kinds, is sold daily in the market at Aala.

The craft used to-day, known as sampans, are light roughly made plank-built launches with considerable sheer in the bows and a low transom stern. They are built of softwood without ribs but suitably strengthened with cross-beams and bracings where necessary. They are equipped with petrol or diesel engines giving them a maximum speed of between 10 and 12 knots in a calm sea. They may be divided into two categories. The inshore boats, the range of which is limited to about 30 miles from the shore, are engaged on catching the *ahi*. Larger craft up to about 50 ft. overall, employed for catching *aku*, are capable of keeping the sea for two or three weeks and frequently go a thousand miles or more to sea, visiting Midway or even Christmas island. Recently vessels of more elaborate construction and equipped with refrigerating plant have been employed. The cost of a Hawaiian sampan varies from $3,000 to $20,000. This cost is, of course, beyond the means of individual fishermen. The craft are usually owned by groups of small capitalists who lease the boats to fishermen, and take 30 % of the catch for payment. A recent attempt by the owners of some thirty-five sampans to claim a larger proportion of the catch resulted in a sit-down strike.

Different methods of fishing are employed for various fish, but fishing for tuna is usually undertaken in the following manner. Small anchovy are first caught in seine nets in the river mouths. Equipped with this live bait the sampan puts to sea and on sighting a shoal of *ahi* stops her engines and drifts into the shoal, when the anchovies are released. Bare barbless hooks are then thrown overboard and the tuna, already excited by the unwonted supply of anchovy, swallow the bare hooks blindly. *Ahi* are canned or are in turn used to catch *opelu*, which are finally used to catch *aku*.

There was recently a danger of the supply of anchovy becoming exhausted, but the government restored the situation by importing and liberating large quantities of fish to restock the rivers.

Pearl oysters were discovered in the lagoon of Pearl and Hermes reef in 1928. They were exploited for a time by Filipino divers in the employ of the Hawaiian Fisheries Company. An expedition dispatched by the government of the territory reported in favour of restricting the exploitation of the oyster beds.

Manufactures

The Honolulu Ironworks, founded in 1853 for the production of sugar-drying plant by David M. Weston the inventor of the centrifugal method of drying sugar, is the principal manufacturing establishment in the Territory. This has equipped all the mills on the plantations in Hawaii and has also exported machinery to China and the Philippines.

The canneries of the pineapple industry are mostly in the Iwilei district of Honolulu, and there are small factories for the manufacture of a composition wall board from the *bagasse*, or refuse stalks of the sugar cane. Paper, cardboard boxes, and cotton mattresses are also manufactured.

Tourist Flow

Hawaii, as a port of call on several trans-Pacific shipping routes, began at an early date to capitalize her traditionally romantic scenery and native customs. An intensive advertising campaign organized by the Hawaii Promotion Committee began to sing the praises of the territory with considerable success. This organization, now known as the Hawaii Tourist Bureau, not only draws funds from interested business concerns but is also subsidized by the territorial government.

Tourists may be divided into two classes: one-day visitors from liners calling at the port, and holiday-makers going to Hawaii for a stay of a fortnight or three weeks.

About forty hotels catering for the tourist have been built. The Matson Line runs a service of fast tourist ships between Honolulu and San Francisco, and on the bathing beach at Waikiki surf riding and other amusements or sports have been developed.

Many people round about Honolulu are engaged in the manufacture of *lei*, garlands of small flowers strung together, which are placed round the necks of visitors.

The tourist trade has been described as Hawaii's third industry. In 1936, the peak year of the trade, 50,000 tourists visited the territory. In addition to these there were about 22,000 one-day visitors.

Labour Conditions

Opportunities for the employment of labour are far greater in the plantations and canneries than in any other industry or undertaking. Small quantities of labour are employed in the docks, by public utility companies, hotels, restaurants and so on, and in the building trade. In building the amount of employment varies with the number of government contracts, which comprise by far the largest part of the total.

Conditions vary considerably, as is only to be expected with the mixture of peoples. There is no fixed eight-hour day though hours of work at most of the plantations and canneries approximate to that. The longest hours are probably worked in the catering establishments in Honolulu, and on the ranches.

On the plantations housing is provided, though frequently only in dormitories for single men. The houses for married employees vary in quality according to the plantation. In many cases free hospitals, recreation facilities and electric light are provided.

Wages vary both by 'race' and by industry. The average monthly earnings of workers below the salary scale on sugar plantations were as follows in 1939 (according to the U.S. Labor Bureau):

Haole	$76	Japanese	$50
Portuguese	$56	Filipino	$46
Hawaiian and part-Hawaiian	$54	Porto Rican	$44
		Chinese	$42

On pineapple plantations wages were slightly higher, being $56 a month for Japanese and $59 for Filipinos.

In the canneries wages are higher still, but this is natural since over 50 % of the employment is only seasonal. In the public utility companies, e.g. railways, electric-light works, telephone companies, the average monthly earnings of Caucasians, Japanese and Chinese

in 1939 were $118, $82 and $113 respectively. But certain other urban occupations are often badly paid and conditions are sometimes poor. There is, however, a great tendency for the children leaving school to find work in the towns, especially Honolulu. In spite of the relatively higher wages on the plantations and better living conditions, there is a feeling that plantation labour confers an inferior status. This will no doubt be partly overcome by the gradual mechanization which is taking place and which will tend to displace unskilled workers by semi-skilled and skilled. Other contributory factors to the unpopularity of life on the plantations are the traditionally autocratic nature of plantation managements and the occasional employment of overbearing gang foremen (*luna*).

Labour movements. Organized labour movements have been slow to develop because, in the early days of plantation economy, the immigrant population were dependent entirely on the plantations for a livelihood and were of such mixed origins. It was also the settled policy of the planters to import more labour than was immediately necessary for the work. The use of a bonus system of payments for work done, which is really a form of deferred wages, tended to discourage strikes, since men were unwilling to risk the loss of their bonus. The more adventurous and intelligent men usually found an opening in Honolulu, while those content to remain on the plantation were more docile. Labour has thus been at a disadvantage by comparison with the closely interrelated and well-organized bodies of employers.

In spite of these conditions strikes have occurred on several occasions, and organization of labour has been growing since the end of the war of 1914–18. The earlier strikes were usually of a very local character, frequently as protests against the behaviour of particular foremen. But in 1919 federations of Japanese and of Filipino labour were formed. Both organizations engineered strikes in Oahu, but refrained from striking on other islands so that their fellow-workers on plantations could maintain them. The strike lasted for seven months and the strikers won concessions in the form of a new wage scale and the abolition of racial differentiation. After this success the organizations disintegrated, though further plantation strikes broke out in 1924 and again in 1937.

In Honolulu various trades have their own organizations, the most powerful of which are the dockers, transport workers and seamen. Serious dockers' strikes broke out in 1937 and again in 1938. Unions are affiliated to both of the two large American labour organizations,

the C.I.O. and the A.F.L., but trade unionism is still relatively weak. The close organization of the managing bodies in every industry in the territory has limited opportunities for successful collective action. The rapidly increasing wage rates have tended to remove the spur of discontent, and the tendency of the unions to differentiate among their own members on racial grounds has restricted the growth of a broad co-operative spirit.

Trade and Commerce

Trade from the Territory of Hawaii is almost entirely with the United States. The trade connexion was established long before annexation by the reciprocity treaty which allowed free access to the American market for Hawaiian sugar. Annexation merely strengthened the commercial bond between the two regions. Small quantities of goods, chiefly pineapples and coffee, are exported to Europe where the greatest consumer is the United Kingdom. Canada, Australia and New Zealand, the Netherlands East Indies, and China and Japan also receive small quantities of Hawaiian products, but about 98 % of all exports goes to the United States. Similarly, imports are almost entirely from America.

The character of the exports changed slightly in the fifteen years before the present war. In 1924 the principal exports to America were sugar, $71,400,000; fruits, of which the majority were pineapples, $27,600,000; coffee, $800,000; hides, $180,000; and rice, $25,000. As a result of the economic crisis of 1931 the production of sugar for consumption in the United States was limited by quota. The percentage allotted to Hawaii was 14·1 of the total American consumption or 918,038 short tons. This figure has been revised from time to time, and the quota was abandoned in 1939 but reimposed early in 1940. Sugar has, therefore, remained relatively stable.

A development in the pineapple industry has been the popularizing of pineapple juice, the value of the exports of which rose to $13,000,000 in 1939. This is about half the value of canned pineapples exported. Hides decreased in value by about a third and rice was no longer exported at all. Canned fish was a new item as also were fibre insulating board, made from sugar-cane refuse, and cotton clothing and new potatoes. The following table shows quantities and values of goods exported to the United States in 1939:

Exports from Hawaii to United States 1939

Commodity	Quantity	Value $
Sugar, refined, mill. lb.	21,823	1,010,470
Sugar, raw, mill. lb.	1,763,123	49,732,875
Molasses, gal.	28,141,249	655,262
Pineapples (fresh), boxes	63,600	140,710
Pineapples (canned), lb.	373,536,174	24,631,405
Pineapple juice, lb.	220,621,559	13,216,988
Bananas, bundles	133,577	112,754
Potatoes, lb.	4,907,294	138,908
Fish (canned), lb.	7,767,664	1,607,986
Fibre insulating board, lb.	25,925,303	786,653
Cotton clothing, lb.	175,468	341,012
Hides, lb.	1,323,049	123,823
Coffee, lb.	2,523,849	286,165
Citric acid, lb.	599,134	119,515
Alcohol, gal.	66,302	22,350

Based on *Annual Reports of the Governor of Hawaii to the Secretary of the Interior*, p. 4 (Washington, 1940).

Imports from the United States consist principally of oil fuel, tinplate, fertilizers, wheat, dairy produce, meat and vegetables. The last two items form a very large part of the total. All meat for the armed forces in the territory is imported because the local cattle do not produce enough fat to satisfy the army specification. The paradoxical situation that vegetables should be imported into an agricultural country is being to some extent modified by recent experiments called forth by present war conditions. From foreign countries the principal import consists of jute bags from India, for the packing of sugar.

Banking

Currency used throughout the territory is that of the United States.

The banking organization of the territory is centred in Honolulu. There are altogether seven banking corporations, with total resources in 1936 of $105,984,466; in addition, there were six investment trust companies with total assets of $7,374,302. Saving in the territory is considerable; in 1936 43 % of the population had savings deposits, the average amount per head being $103.88. Roughly 10 % of the savings deposits were made by Chinese. The Filipinos also made considerable savings, but large sums were taken out of the country by them when they returned home.

Economic Trends

It is noteworthy that Hawaii, while essentially an agricultural region and an exporter of agricultural produce, is not self-supporting in foodstuffs. There is even insufficient grazing to provide meat for the whole population. The large-scale plantation industries of sugar and pineapples have inhibited the growing of vegetable foods in any large quantities. A further difficulty in the way of increasing the degree of self-sufficiency of the territory is the tendency, where land is converted to mixed farming, to produce luxury crops such as asparagus, avocadoes, papayas and other produce which will fetch a high price on the mainland, rather than essential foodstuffs. But the limit of population for which employment can be found seems to have been reached; and the limitations of exports imposed by world conditions are tending more and more to drive the people of Hawaii to the raising of miscellaneous crops for home consumption. It is significant that in 1939, stimulated by the prospect of war in the Pacific, the Hawaiian Sugar Planters Association, the Pineapple Producers Association, and the University of Hawaii Agricultural Extension Service, drew up a combined plan to plant vegetable foods on seven sugar plantations and three pineapple plantations. Including certain marginal lands, roughly 12,000 acres were devoted to this experiment.

A possibility is that with the impetus given to mixed farming brought about by strategic necessity, this type of agriculture may become an important factor in the economy of the territory. This might well go some way to solve the difficulties caused by the unwillingness of the present-day educated Hawaiians (of all groups) to submit to the restrictions of plantation employment. But it is impossible to say how far the firmly entrenched plantation interests would react to a serious curtailment of their position.

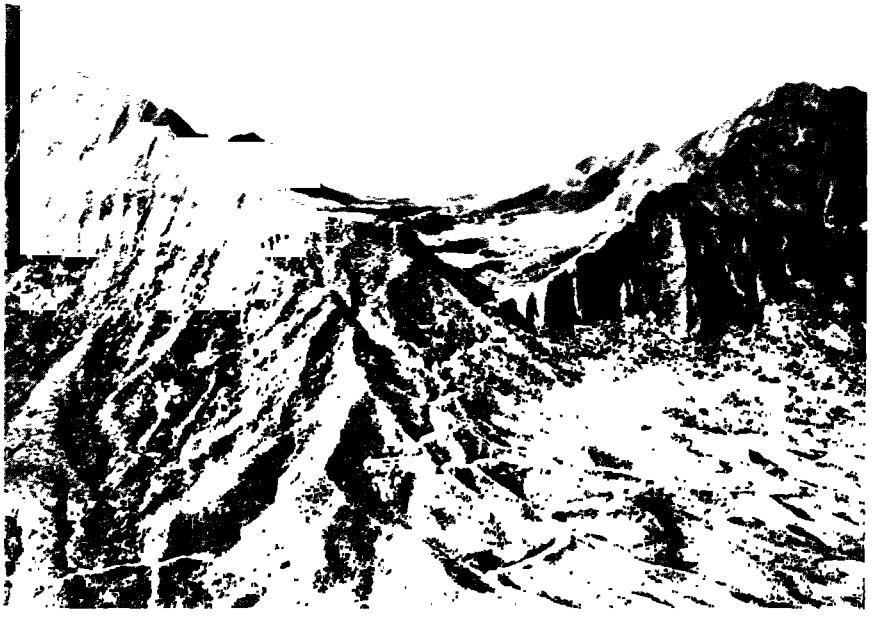
COMMUNICATIONS

Sea Communications

Sea communications with Pacific coast ports, Panama, the northwest coast of America as well as with the Far East, New Zealand and Australia, are maintained by several steamship companies.

The Matson Line, Oceanic Steam Ship Co., American President Lines, Canadian Pacific, Canadian-Australasian Line and N.Y.K.





Plates 71, 72. Roads on Oahu

Plate 71 (above) shows a part of the Federal Highway round the coast, with easy gradient and curves, and width sufficient for two lines of traffic. Plate 72 (below) shows the road over the Nuuanu Pali, with the sharp bends characteristic of the mountain roads in the interior.



Plate 73. Train on the Oahu Railway near Kaena point
Passenger traffic is falling off as the result of road competition and the rolling stock is used mainly for tourist sightseeing journeys round the island.

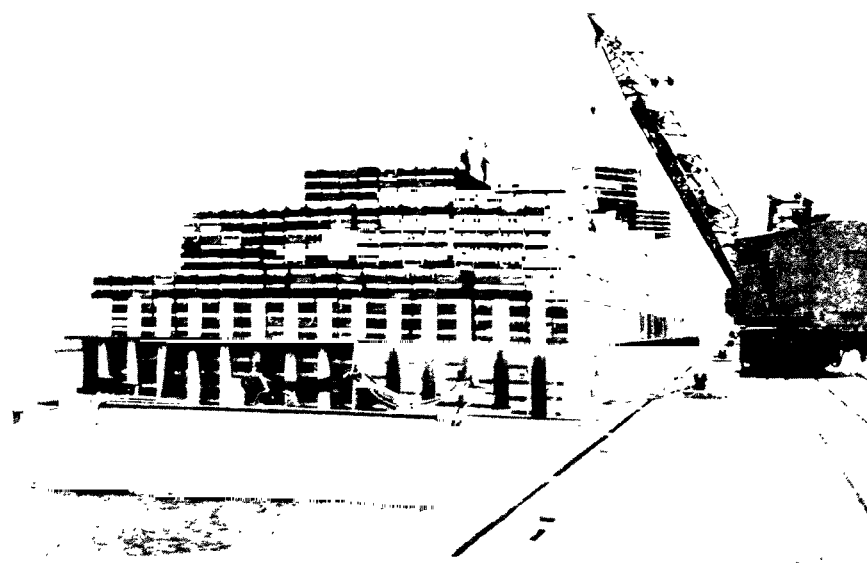


Plate 74. Barge unloading pineapples in Kapalama basin, Honolulu
These large craft, of 880 tons, are used primarily for the transport of pineapples from Lanai.

Line were the most important in 1939. The Matson Line is partly owned by local capital and maintains a frequent passenger service with large vessels between Honolulu, San Francisco and the Antipodes via Samoa. In addition to the above, numerous freighters call at the principal ports of the territory. Since Hawaii is American territory and under American navigation laws all passengers and freight between American ports must be carried in American bottoms. Foreign vessels provide but a small portion of the shipping visiting the territory (about 98 % of the trade of the groups is with the mainland of the United States). Local sea-borne traffic is carried on by the Inter-Island Steam Navigation Co., which has its headquarters at Honolulu, and maintains services of varying frequency to all islands in the territory. The vessels employed on these local services in 1939 consisted of S.S. *Haleakala*, 3,679 tons, built in 1923; S.S. *Hualalai*, 3,088 tons, built in 1929; S.S. *Waialeale*, 3,092 tons, built in 1928; S.S. *Kilauea*, 1,339 tons, built in 1911; S.S. *Humuula*, 916 tons, built in 1929; and S.S. *Hawaii*, built in 1911. The same company also owns three tugs and five 880-ton barges for the transport of pineapples from Lanai to Honolulu (Plate 74). Two other tugs are owned by a company operating under the name of Isleways Ltd.

Railways (Figs. 112, 113, 115, 116)

Railway communication falls roughly into two categories—the public railways (Plate 73) and the light railways. The latter are often only temporary tracks built by the various plantations either to bring sugar cane to their mills or else to act as feeders to the public railways. Gauge varies from island to island. In Hawaii it is 4 ft. 8½ in.; in Oahu 3 ft.; in Maui 3 ft.; in Kauai 2 ft. 6 in. The total length of railway track in the territory is about 600 miles, of which about 300 miles are open to traffic.

The most important railway, the Oahu Railway, running from Honolulu to Wahiawa in the centre of the island and round the west and north coast, had about 90 miles open to traffic in 1940. Rolling stock on this line consisted, at that time, of twenty-three steam locomotives, four petrol-driven rail-cars, thirty-six passenger coaches and 1,318 goods wagons. The rolling stock of the Hilo Railway in Hawaii consisted of eight steam locomotives, five passenger coaches and 231 goods wagons. Railway traffic in both passengers and goods has been falling steadily in the face of road competition. As far as

passengers are concerned, it will probably cease altogether except for scenic excursions round the coastline in Oahu.

In addition to the railway systems there is a tramway system in Honolulu.

Roads

Owing to the mountainous nature of the territory, roads in the interior of the islands are scarce. But excellent roads, usually with

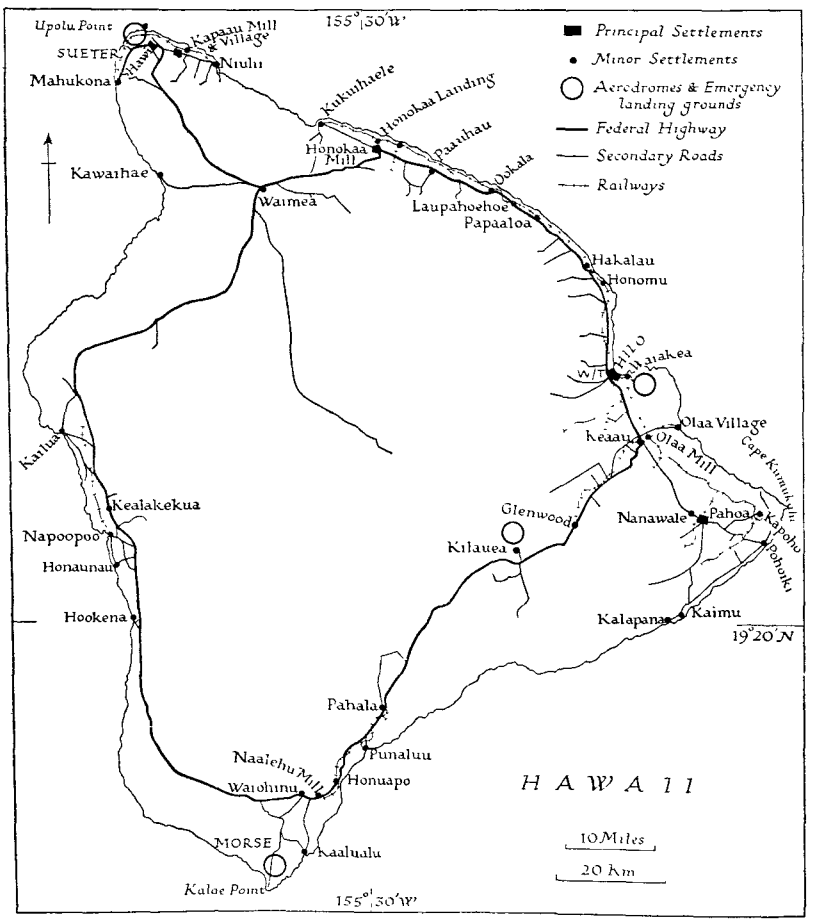


Fig. 112. Hawaii: communications and principal settlements

For general key to symbols see p. 8. Based on: (1) U.S. Coast and Geodetic Survey chart no. 4115; (2) U.S. Navy aviation chart no. V. 450; (3) U.S. Geological Survey topographic series of Hawaii, 1915–32; (4) Federal Aid Highway System Road Progress Map of 1937.

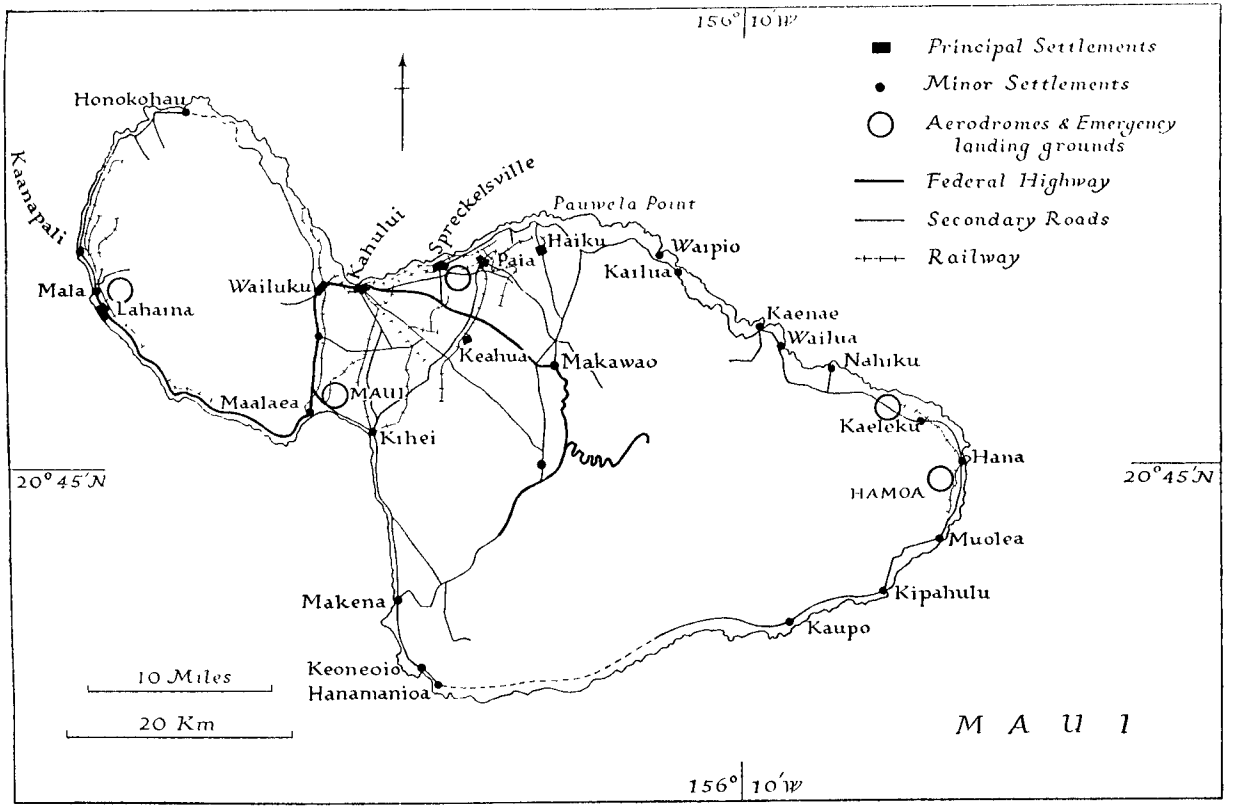


Fig. 113. Maui: communications and principal settlements

Based on: (1) U.S. Coast and Geodetic Survey chart no. 4116; (2) U.S. Navy aviation chart no. V. 450; (3) U.S. Geological Survey 1 : 62,500 topographic series of Maui, 1925–8; (4) Federal Aid Highway System Road Progress Map of 1937.

bitumen or macadam surface, are to be found round the coasts, which are the more populated and developed districts. The general pattern of road communications, which is applicable to all the islands, is to build a main road more or less following the coast with feeder roads from the plantations and settlements (Figs. 112–116). Road building and maintenance is normally the responsibility of the county authorities. Important roads are, however, being improved and maintained by federal grants (Plates 71, 72). In 1939 the distance of roads so improved was 2,095 miles. There are very large numbers of motor vehicles. The figure for private cars in 1939 was 66,485,

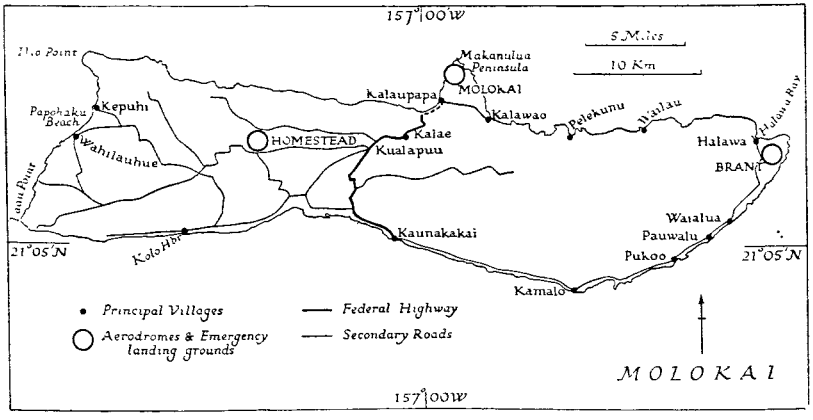


Fig. 114. Molokai: communications and principal settlements

Based on: (1) U.S. Coast and Geodetic Survey chart no. 4116; (2) U.S. Navy aviation chart no. V. 450; (3) U.S. Geological Survey 1 : 62,500 topographic map of Molokai, 1924; (4) Federal Aid Highway System Road Progress Map of 1937.

which is roughly one car for every six people in the territory. There were over 10,000 lorries in the territory in 1932 as well as buses and motor-cycles, and it is probable that the numbers have increased considerably since then.

Air Communications

Apart from service airfields there are airfields and emergency landing grounds in all the islands of the territory (Figs. 112–116). In 1930 there were civil airfields at: Hilo (Hawaii); Maalaea and Hana (Maui); Homestead (Molokai); John Rodgers near Honolulu (Oahu); and north of Hanamaulu bay and at Barking Sands (Kauai). There were emergency landing grounds at Volcano House (Hawaii); Spreckelsville and Honokohau (Maui); Kalaupapa (Molokai); Kahuku,

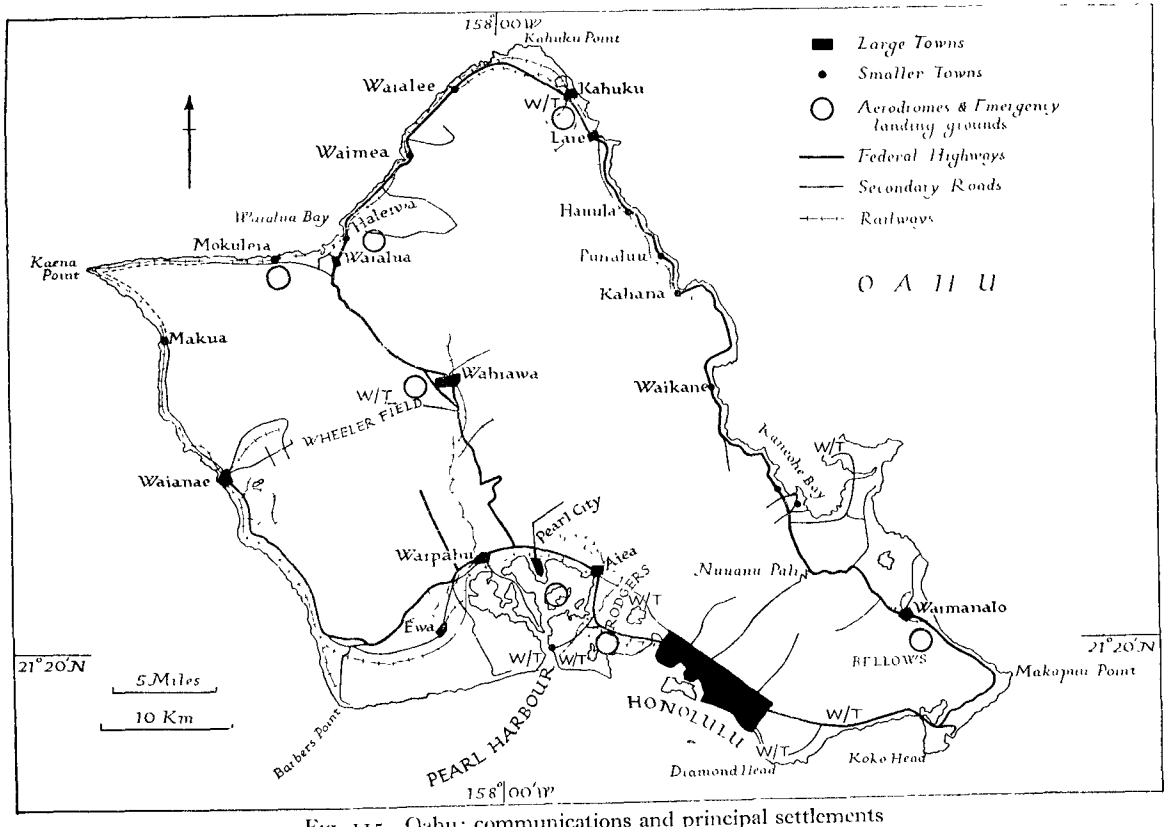


Fig. 115. Oahu: communications and principal settlements

Based on: (1) U.S. Coast and Geodetic Survey chart no. 4116; (2) U.S. Navy aviation chart no. V. 450; (3) U.S. Geological Survey topographic map of Oahu, 1938; (4) Federal Aid Highway System Road Progress Map of 1937; (5) other official sources.

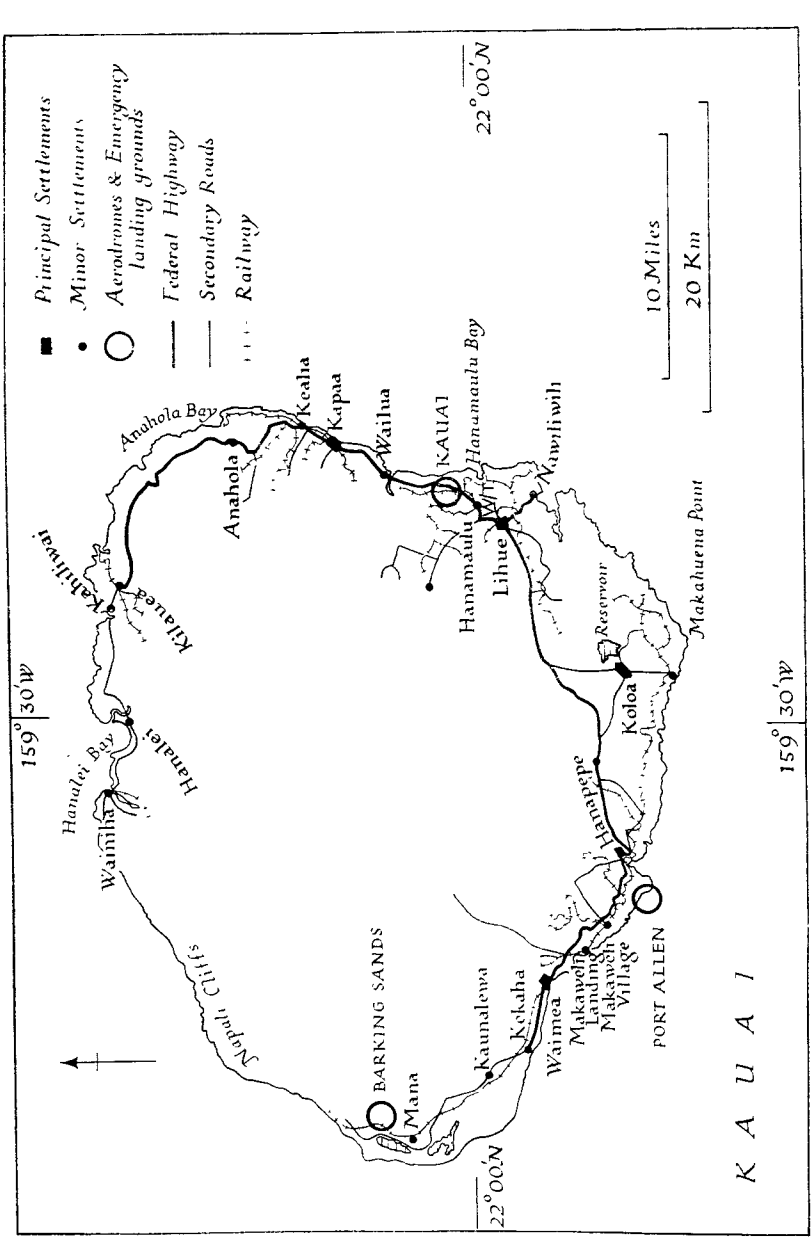


Fig. 116. Kauai: communications and principal settlements

Based on: (1) U.S. Coast and Geodetic Survey chart no. 4117; (2) U.S. Navy aviation chart no. V. 450; (3) U.S. Geological Survey 1:62,500 topographic map of Kauai, 1912; (4) Federal Aid Highway System Road Progress Map of 1937.

Mokuleia and Haleiwa (Oahu); and on Lanai. The numerous service airfields are not listed. Midway (Fig. 135) was an airfield on the Pan-American Airways service across the Pacific. In 1940 the position as regards civil airports was much the same as in 1930.

A local service was maintained by Inter-Island Airways who were under contract to carry mails. In the year ended in June 1937 over 300,000 plane-miles were flown and about 19,000 passengers carried. At that time six aircraft were employed.

Signal Communications

Honolulu is a station in the trans-Pacific cable system which runs from San Francisco via Honolulu, Wake island and Guam, to the Philippines and the Far East. Wireless telegraph stations are maintained both by the federal government of the United States and by various private concerns. They number in all about twelve. Of these the majority are in Oahu, but each of the other large islands has at least one.

Each of the larger islands has its own telephone system linking the towns and the larger plantations. Each island system is in turn linked by wireless telephone with those on other islands, so there is complete communication throughout the group. Most of the lines are overhead, but underground cables are laid in the larger towns.

In 1936 there were 24,200 telephones in Oahu, 2,900 in Hawaii, 1,900 in Maui, and about 200 in Molokai. Thus there was about one instrument to every twelve people in Oahu, one to every twenty-five in Hawaii and Maui, and one to every eighteen in Molokai. In Kauai, there was one to every thirty.

PORTS

There may be said to be three phases in the growth of overseas communication with the Hawaiian islands. The first dates from their discovery in 1778 to the close of the whaling period in the middle of the nineteenth century. The second was a pioneering period associated with the growth of large-scale plantation agriculture. The third, dating from the early part of the twentieth century is characterized by comparatively well-developed communications within the islands which have displaced the small landings formerly required to serve the plantations.

In the mid-nineteenth century, Lahaina (Fig. 125 and Plate 80) in the island of Maui competed with Honolulu in Oahu as a base for

the small whaling vessels of the day. Honolulu (Figs. 119, 120 and Plate 76), a natural indentation in the reef, provided by far the better port. Lahaina was merely an open roadstead which provided a safe anchorage for the summer months, but was not protected from the *kona* (south-westerly) storms which swept the islands on occasions. As a former royal residence, the village did, however, attract many traders and whalers, but when the royal warehouses were established at Honolulu, trade and the foreign population gravitated there. Thus Honolulu became the primary port in the islands.

As the cultivation of sugar increased plantations were established along the windward coasts on all suitable ground. Overland communications were non-existent and landings of a pioneer character were improvised to serve each plantation. In many cases a small wooden jetty, projecting to the reef edge or into about 6 ft. of water, was built for boats or lighters to come alongside. On the precipitous east coast of Hawaii cable landings were erected. These consisted of a hawser stretched from winding gear on the top of a cliff to buoys moored in deep water (Fig. 117). Steamers moored near them and cargo was hauled over the cable lines to the top of the cliff. Such a procedure was unsatisfactory and could only be undertaken in favourable weather. With the development of road and rail traffic these primitive landings were abandoned and traffic was concentrated on a few convenient ports which were developed at the expense of these temporary landings.

As recently as 1908, fifty-two landings of various kinds were listed by one writer. Most of these were served by inter-island steamers. Of late, however, the tendency has been to concentrate the trade of each island more and more at one or possibly two ports. In Oahu land communications have been so developed that there are no ports or landings of any importance apart from Honolulu. Landings are more frequent on the less well-developed islands (Fig. 118). For example, Molokai, one of the more sparsely populated and smaller islands, has three ports on the south coast alone. After Honolulu the major ports are Hilo in the island of Hawaii, Kahului in Maui and Port Allen (Hanapepe) and Nawiliwili in Kauai (Plates 78, 79, 81, 82). Oil fuel can be obtained, and some repairs can be undertaken at all these ports except Port Allen and Nawiliwili.

Some idea of the relative commercial importance of the major ports is shown by the fact that in 1936 shipping entering and clearing all Hawaiian ports amounted to 10,623,529 tons, of which 7,370,141 tons was the figure for Honolulu. While part of the local

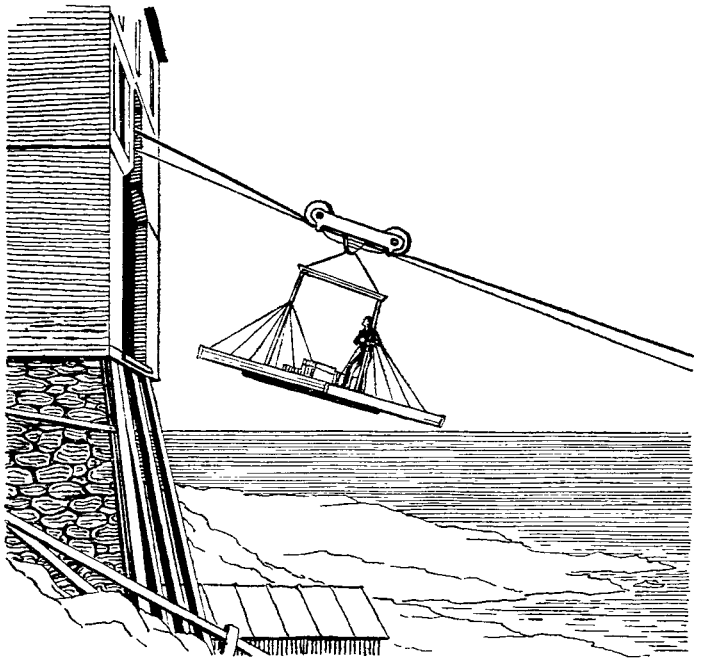


Fig. 117. Cable landing

A device of a type used especially on the north-east coast of the island of Hawaii. Based on a photograph.

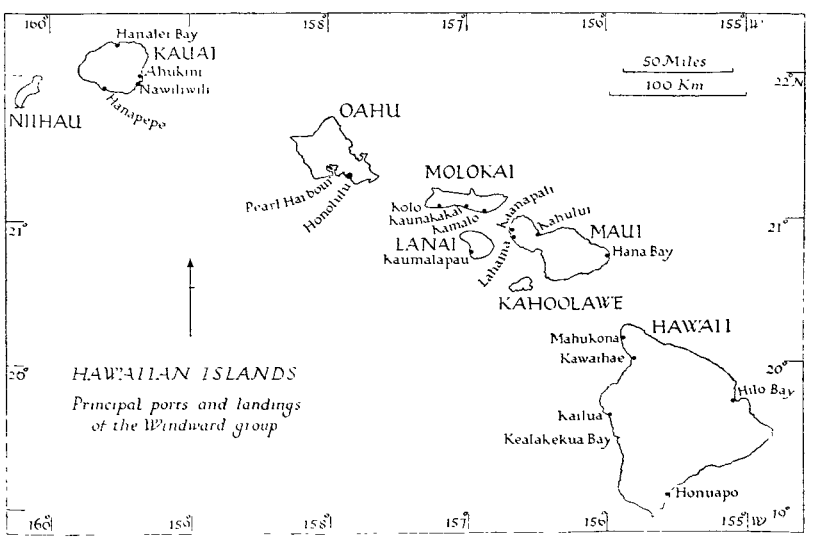


Fig. 118. Principal ports and landings in the Hawaiian islands

Based on U.S. Coast and Geodetic Survey chart no. 4000.

produce of the other islands is shipped to Honolulu for re-export, appreciable quantities are exported direct, not only from Hilo, Kahului, etc., but also from minor shipping points such as Mahukona and Hana bay.

Certain of the minor landings are also used for the direct shipment of cargo to the mainland and are thus of some commercial importance. These and others where the anchorage is good or which are of particular local significance are described below. Others, including abandoned landings and ports, are not considered.

In general port facilities at these minor landings are limited, and at practically none of them can vessels come alongside a pier or wharf. The essential features seem to be some sort of pier or landing stage, a few lighters for unloading cargo, possibly a crane or derrick, and simple communications by road or rail with the districts they serve. Nowhere in the Hawaiian group is the extreme range of tides more than about 3 ft., and this facilitates operations.

Honolulu (lat. 21° 19′ N, long. 157° 55′ W approx.)

Lying on the south side of Oahu, about 4 miles east of the entrance to Pearl harbour, the port of Honolulu (Fig. 119 and Plate 76) is not only the largest in the Territory of Hawaii, but in the Pacific islands as a whole. The town of Honolulu (Fig. 120), with a population of 181,000 in 1940, is the administrative and commercial capital of the islands, and caters in addition for a large tourist trade. Situated in the centre of the north Pacific, it is a convenient port of call for practically all vessels sailing between North America and the Far East. The accommodation alongside wharves is adequate for large numbers of vessels and entry is easy. The port is liable to silt up and frequent dredging operations are undertaken to preserve the depth. Entry from the sea is through a channel with a minimum depth of 38 ft. and a width of about 400 ft. This channel is dredged and cut through the reef for a distance of five-eighths of a mile. The coral reef itself extends from the shore for a distance of about half a mile. Vessels can anchor outside the port in from 8 to 12 fathoms, but the ground shelves rapidly towards the reef. The mean tide range is under 2 ft. with an extreme range between springs of 3 ft. 4 in.

Detailed Description. The port consists of a main harbour about half a mile long and with a width varying from 900 to 1,500 ft., and an inner basin (the Kapalama basin) reached through a channel about 450 ft. wide with a minimum depth of 35 ft. About five-eighths of a

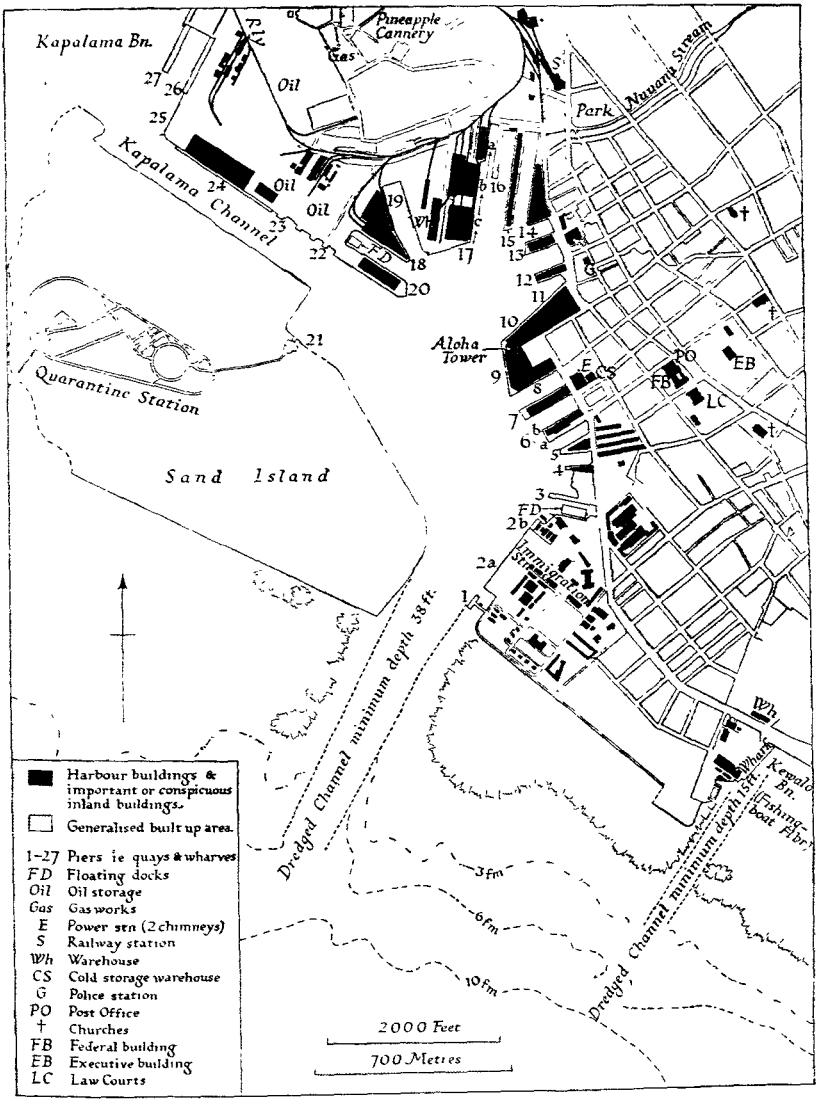


Fig. 119. The port of Honolulu

Based on: (1) Admiralty chart no. 1378; (2) other official sources.

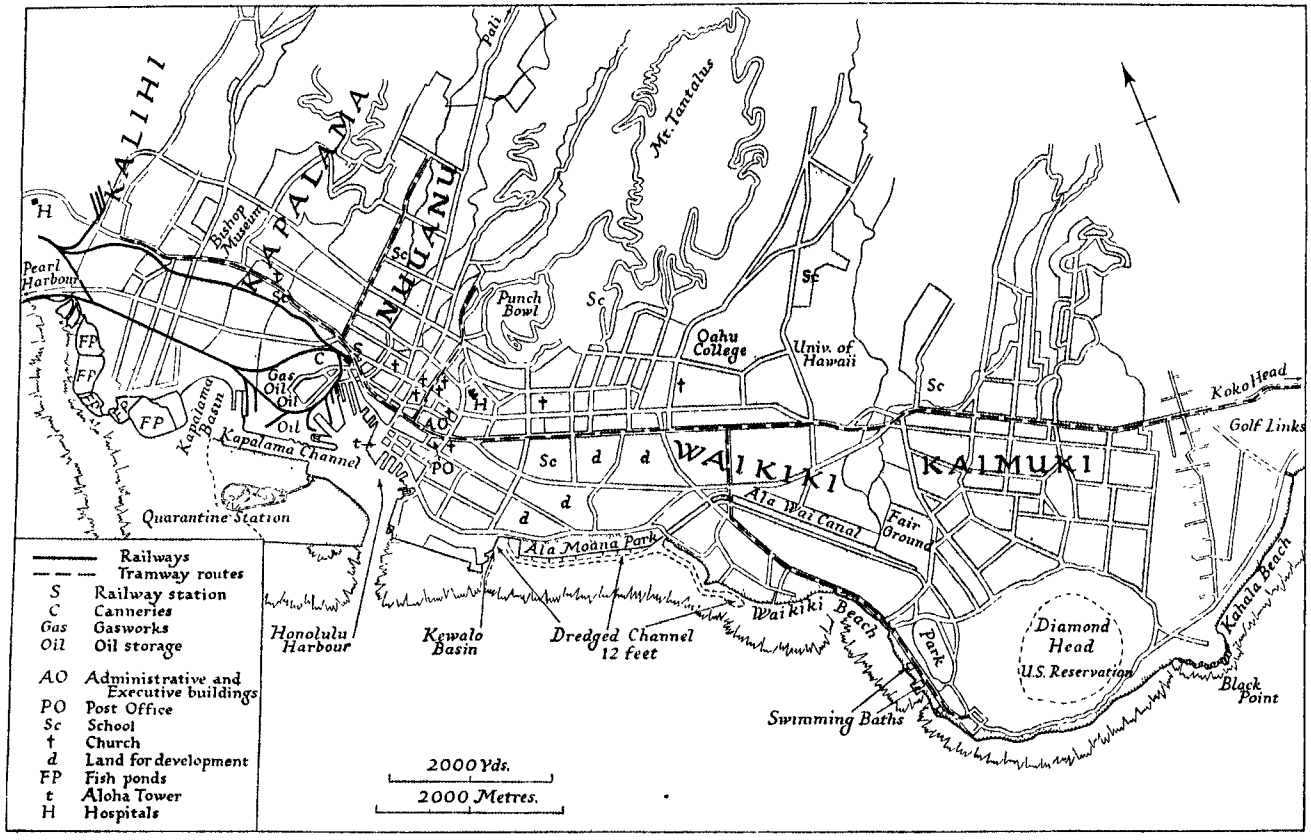


Fig. 120. The city of Honolulu

Principal roads only are shown. Built-up areas are generalized to include dwellings in gardens. Based on: (1) *Standard Tourist Guide of Hawaii*, p. 32 (Honolulu, 2nd ed. 1930); (2) official sources.

mile to the east of the main harbour and entirely separate from it is a fishing harbour, the Kewalo basin. The harbour itself is flanked on its east and north sides by the town of Honolulu and on the west by reclaimed land, the most southerly point of which is Sand island. The quarantine station is situated here.

Wharf Frontage and Equipment. Quays are grouped round the eastern and northern sides of the main harbour either in the form of wharves fronting the town or of piers projecting into the harbour. There are also three wharves on the eastern side of the Kapalama basin. The whole of the north side of the Kapalama channel leading to the Kapalama basin from the main harbour is fronted by new wharves, some of which are apparently oiling berths only. The total wharf frontage (including the Kapalama basin) is about 22,000 ft. Of this 21,000 ft. is available for berthing. Details of individual wharves, length, berthing space, depth alongside sheds, ownership, use, etc., are set out in a table (pp. 394–6). This is based on tables in *The Ports of the Territory of Hawaii* (Washington, revised edition, 1935), with corrections based on the *Annual Reports of the Governor of Hawaii*, 1927–39, and on a recent chart. Where discrepancies occur between these sources, the chart has been followed.

There are no specialized methods of handling cargo. It is brought to the wharves by rail or lorry and loaded direct into ships. Cargo landed from ships alongside is removed from sheds on wharves by rail to other parts of the island or by lorry to warehouses in the town. Wharves with rail connexions link up with the 3 ft. gauge lines running over most of the island. The principal warehouses in Honolulu belong to the Oahu Railway Co., the Honolulu Draying Co. and American Factors Ltd. There is also a cold-storage warehouse in the Kakaako district and there are four warehouses for the storage of cement.

Bunkering and Water. There are several large oil tanks in the Iwilei district. Supplies are brought from Californian ports by tankers belonging to the Standard Oil Co. and the Associated Oil Co., and oil supplies were available in 1938 at all wharves except 1, 2*b*, 3, 4 and 6*a*. But plans were made to provide a 10 in. oil pipe-line to all additional wharves, and it is probable that this has now been done.

No stocks of bunker coal are now maintained either in Honolulu or anywhere in the territory. There are ample supplies of water from the city mains, mostly through 4 in. pipes.

Table of Wharf details. Berthing space etc., HONOLULU

Key. Owners: F, United States Government; T, Territorial Government; M, Matson Line; I.I., Inter-Island Steam Navigation Co.; O, Oahu Railway Co. Construction: C, concrete; P, pile and timber; E, masonry bulwark, earth-filled.

Wharf lengths available for berthing in italics. Wharves and piers numbered consecutively from the east side of the harbour entrance.

No. on plan	Owner	Construction	Height above M.L.W. in ft.	Load lb. per sq. ft.	Length of sides in ft.	Depth alongside in ft.	Use	Mechanical equipment	Remarks
1	F	C	7	350	Outer 55 Face (w) *175* Inner 55	5 32 20	U.S. Army	None	Local name, Pier No. 1
2*a*	F	C	7	350	Outer 22 Face (w) *868* Inner —	28 35 —	Lumber coal freight	None	The two piers are one continuous wharf with a total frontage of 988 ft. There is a spur line connecting No. 2*a* with the street tramway system. Local name, Pier No. 2
2*b*	F	C	7	250	Outer — Face *120* Inner 50	— 35 12	—	None	
3	I.I.	P	7	250	Outer 545 Face (w) 65 Inner 325	45 31 30	In connexion with floating dock	None	Local name, Pier No. 3
4	F	C	7	1000	Outer — Face (w) 20 Inner *325*	— 28 21	Lighthouse service	None	Local name, Pier No. 4
5	F	P	7	250	Outer *360* Face (w) 42 Inner *385*	30 35 30	Q.M. Dep. U.S. Army	None	Shed with several floors 270 × 120 ft. Local name, Pier No. 5
6*a*	F	C	6	100	Outer *500* Face (w) *120* Inner *500*	30 35 30	U.S. Navy	1 steam-operated stiff-leg derrick; 80 tons per hr.	Two sides of the same wharf. Shed 200 × 30 ft., 1 floor. Spur line connecting with street tramway system. Local name, Pier No. 5*a* or Navy Pier
6*b*	T	C	6	250			Overseas passenger and freight	None	Shed 489 × 70 ft., 2 floors, 8 passenger galleries. Local name, Pier No. 6
7	T	P, partly E	7	250	Outer *609* Face *120* Inner *609*	30 35 30	Overseas passenger and freight	None	Shed 540 × 100 ft., 2 floors and passenger galleries. Local name, Pier No. 7

8	T	C	7	500	Face (s)	*615*	32	Overseas passenger and freight	None	Irregular-shaped shed conforming to shape of the three wharves which are adjacent. Local name, Piers Nos. 8, 9, 10 respectively
9	T	C	7	500	Face (w)	*624*	35	Overseas passenger and freight	None	
10	T	C	7	500	Face (n)	*470*	35	Overseas passenger and freight	None	
11	T	C	7	1000	Face (n)	*496*	35	Overseas passenger and freight	None	Continuation of No. 10 to give combined berthing space of 1,000 ft. (this does not agree exactly with lengths of the two wharves). Shed built on wharf. Local name, Pier No. 11
12	I.I.	P	7	250	Lower Face Upper	*280* 110 395	30 35 30	Cable ship	None	Shed 340 × 70 ft. Local name, Pier No. 12
13	I.I.	C	7	500	Lower Face Upper	*372* *145* *319*	30 35 30	Inter-island traffic	None	Built 1930–1 to replace two separate 'piers'. Inter-island traffic from this pier now handled in the Kapalama basin. Shed on wharf. Measurements based on charts. Local name, Piers Nos. 13 and 14
14	T	P	7	250	South West	*275* *990* (*720*)	30 35	Ocean-going passenger and freight (Matson Line)	None	Shed 260 × 700 ft. Local name, Pier No. 15
15	T	P	7	250	East South West	*1140* 109 *1165*	36 35 26	Ocean-going passenger and freight	None	Shed 1,062 × 60 ft. Local name, Pier No. 16
16	?	P	7	250	East South West	*580* 52 *600*	35 35 35	Freight	None	Formerly owned by Railway Company. Local name, Pier No. 17. Shortened recently. Present measurements based on recent chart
17*a*	O	P	7	250	East	450 (*400*)	35	Overseas passenger and freight	—	17 *a*, *b*, *c* are continuations of the same wharf, *b* and *c* are set back. Sheds 385 × 70 ft. on (*a*), 403 × 304 ft. on (*b*), 400 × 269 ft. on (*c*). Railway tracks on wharves and in sheds. Local name, Piers Nos. 18, 19, 20 respectively
17*b*	O	P	7	250	East	*530*	35	Overseas passenger and freight	3 movable electric sugar conveyers (*b*)	
17*c*	O	P	7	250	East	*470*	35	Overseas passenger and freight	3 movable electric sugar conveyers (*c*)	

Table of Wharf details (continued)

No. on plan	Owner	Construction	Height above M.L.W. in ft.	Load lb. per sq. ft.	Length of sides in ft.	Depth alongside in ft.	Use	Mechanical equipment	Remarks
18	I.I.	C	7	800	North-east *565* South *685*	30 30	Freight and passenger inter-island service	6 movable electric sugar conveyers	Shed of irregular shape covering most of wharf, 4 railway tracks. Local name, Piers Nos. 25 and 26
19	I.I.	C	7	800	North-east *565*	30	—	—	Inshore continuation of No. 18. Shed of irregular shape, area about 19,000 sq. ft. Local name, Pier No. 24
20	I.I.	C	7	800	North *600* East *200* South *800*	30 35 35	Formerly bunkering	2 electric travelling gantry cranes; capacity 100 tons per hr.; probably removed	Formerly coal dump on wharf. Now no stocks of bunkering coal are maintained. Local name, Piers Nos. 27 and 28. Shed on wharf. Floor space about 864,000 sq. ft. Measurements from recent U.S. chart
21	F	?	?	?	?	?	Quarantine	—	Fumigating shed
22	?	?	?	?	Face (s) *60* *60* *60*	36	?	?	New wharf on north side of Kalihi channel, appears to consist of three short projecting faces against which small vessels can come alongside to discharge oil. Information based on measurements from recent chart. Local name, Pier No. 29
23	?	?	?	?	Face (s) *75*	36	—	—	New wharf on north side of Kalihi channel, short projecting face. Information based on measurements from recent chart. Local name, Pier No. 30
24	?	?	?	?	Face (s) *1320*	36	—	—	New long continuous wharf on north side of Kalihi channel. Shed with floor space of about 194,400 sq. ft. Local name, Piers Nos. 31, 32 and 33
25	?	?	?	?	Face (w) *360*	31	?	?	New wharf on east of Kapalama basin. Measurements from recent chart. Local name, Pier No. 34
26	T	C	?	—	West *704*	15	Largely inter-island freight	—	4 railway tracks and track for mobile crane. Completed 1931. Known as Pier No. 35
27	T	C	?	—	East *540*	15	Largely inter-island freight, in particular pineapples from Molokai and Lanai	—	Presumably identical with No. 22. Completed 1934/5, known as Pier No. 36. Measurements from recent chart. Known as Pier No. 36

Repair Facilities. There are three floating docks at Honolulu owned by the Inter-Island Steam Navigation Co. They are situated alongside Pier No. 3 and between Piers Nos. 26 and 27 (18 and 20 on plan). The principal dimensions of these docks are as follows:

	No. 1*	No. 2*	No. 3
Length of floor	352 ft.	165 ft.	53 ft. 6 in.
Breadth of entrance	76 ft.	76 ft.	39 ft. 8 in.
Depth of sill (M.H.W.S.)	23 ft. 6 in.	21 ft. 6 in.	10 ft.
Depth to keel blocks	18 ft.	18 ft.	7 ft.
Lift	5,500 tons	2,500 tons	150 tons

* Nos. 1 and 2 are reported to be capable of being used together in tandem.

Based on U.S. War Department, Corps of Engineers, *Port Series, No. 17, The Ports of the Territory of Hawaii*, p. 61 (Washington, 1935).

The exact position of these docks is uncertain. The Admiralty chart shows two positions for floating docks but gives no indication of the distribution of the three docks between the two positions. In view of the possibility of combining Nos. 1 and 2 these two docks may both be near Pier No. 3.

Repairs to machinery can be undertaken by the Honolulu Iron-works behind Pier No. 3 and also by Messrs Catton Neill and Co., who have facilities for making shafts and castings, or in the shops of the Oahu Railway Co.

Kewalo Basin. The Kewalo basin is used as a base for fishing craft and an anchorage for pleasure yachts. It lies five-eighths of a mile east of the main harbour entrance. Access is obtained through a dredged channel with a width of about 150 ft. and a depth of about $2\frac{1}{2}$ fathoms. The basin is roughly rectangular in shape, about 900 ft. in an east-west direction and 600 ft. in a north-south direction. Depths vary from $1\frac{1}{2}$ to 3 fathoms. A channel extends eastwards for about 3,000 ft. skirting the embanked shores of a public park to the entrance of the Alawai canal, where there is landing for small boats.

History of Honolulu

Since Honolulu is the principal port of the territory, the capital, and the seat of government, any detailed historical account would be very largely the history of the islands, and the treatment here is therefore brief.

An old French Admiralty chart dated 1855 shows that at that time the port consisted of six or seven piers or jetties projecting from Queen Street, which formed the water front. The area north of the harbour

now occupied by Piers Nos. 14 and 20 was swampy ground, and areas in it were enclosed by the Polynesian inhabitants as fish ponds. The present Sand island was a bank behind the coral reef which dried out at low water. The built-up portion of the town was bounded roughly by the Nuuanu stream in the north, Queen Street in the west and South Street in the south. The fort built by the Russians was behind the present block of wharves known as Piers Nos. 8, 9, 10 and 11. Small isolated houses were built out in the direction of Punchbowl, and across the Waikiki plain. The whole of the modern industrial district of Iwilei was marshy ground used for the cultivation of taro, and the district behind Waikiki beach consisted of swamps and fish ponds. The whole of the present Kakaako district to the eastern side of the harbour entrance is reclaimed land.

To-day the town (Fig. 120 and Plates 75, 77) has spread all over the taro fields, inland on both sides of Punchbowl and in the form of a suburb out to Diamond head. By the erection of groynes the beach at Waikiki has been improved. Parks and hotels have been built where there used to be swamps, and this area is now a popular tourist resort, largely visited by people from the western states of America.

New harbour works and reclamation of land have gradually pushed the water front farther and farther west, and recent improvements have largely taken the form of replacing wooden piers with structures of reinforced concrete.

The Kapalama basin was projected in 1923. The channel from the harbour basin was dredged in 1926 and the first wharf completed in 1927. A further extension to this wharf was commenced in 1928, and the second pier similar to the first was built in 1931. At first this basin was used only for barge traffic, but in 1936 when the Oahu Railway Co. abandoned Pier No. 17 (15 on plan), which has since been shortened, pineapple traffic from Molokai formerly dealt with at this pier was transferred to the Kapalama basin. The depth alongside the wharves in 1933 was 15 ft. This has probably been dredged to about 20 ft. by now. Additional wharves have been built in the Kapalama channel since 1936. There is another entry to this basin in addition to the channel from the main harbour. This is the Kalihi entrance about $1\frac{1}{2}$ miles westwards of Honolulu. This is described as being suitable only for small boats, but a recommendation was made that this entrance should be widened to 900 ft.

In the main harbour itself, Pier No. 11, a shoreward extension of Wharf No. 10, was built in 1927 to provide a combined length of about 1,000 ft. to accommodate the then new Matson liner *Malolo*, 17,226 tons (subsequently renamed *Matsonia*).



Plate 75. Honolulu from Punchbowl hill

In the foreground are small houses and bungalows covering the residential areas; in the middle distance are large commercial buildings near the water front (the power station, with two chimneys, is particularly prominent). Pier 10 (the dock where Kamehameha's ship and Kalibi entrance are on the extreme left).



Plate 76. Honolulu, aerial view of wharves and part of commercial district

Photograph probably taken about 1936. Some changes have been made since then, including shortening of pier no. 17 (left-hand one of the pair projecting down from top right) and development along the Kapalama channel (top left).



Plate 77. Honolulu and Diamond head

The suburb of Waikiki, with the Royal Hawaiian Hotel and Moana Hotel, is in the foreground.



Plate 78. Hilo, Hawaii

The photograph shows only the western half of the town.

The Inter-Island Steam Navigation Co. abandoned Piers Nos. 13 and 14 (No. 14 on plan) in 1938, and at the same time the harbour commissioners were approached by various shipping companies about the provision of further accommodation for new tonnage expected to use the port. The most suitable area for further developments was considered to be in the neighbourhood of Piers Nos. 13, 14 and 15, but no work had been undertaken up to 1939 owing to lack of funds.

Trade

Honolulu, in addition to the direct import of goods from overseas for local consumption, and the export of Oahu produce, has a con-

Average Annual Trade of Honolulu 1924–33

	Imports (short tons)			
	U.S.A.	Foreign ports	Other islands	Total
Fertilizers	40,155	50,056	—	90,211
Coal and coke	—	18,931	—	18,931
Jute, bags	5,996	—	—	5,996
Cattle food	45,033	—	—	45,033
Petroleum products	357,354	—	—	357,354
Iron and steel (mfd.)	34,474	—	—	34,474
Lumber	98,584	—	—	98,584
Sugar	—	—	58,350	58,350
Pineapples	—	—	83,653	83,653
Cattle	—	—	3,277	3,277
Fresh vegetables	—	—	1,694	1,694
Coffee	—	—	2,105	2,105
Other	281,633	21,552	—	303,185

	Exports (short tons)			
	U.S.A.	Foreign ports	Other islands	Total
Fertilizers	—	—	69,206	69,206
Coal and coke	—	3,041	—	3,041
Jute, bags	—	—	1,835	1,835
Cattle food	—	—	—	—
Petroleum products	7,089	3,014	33,951	44,054
Iron and steel (mfd.)	—	—	—	—
Lumber	—	—	—	—
Sugar	267,699	—	1,835	269,534
Pineapples	161,976	4,114	—	166,090
Cattle	—	—	—	—
Fresh vegetables	—	—	—	—
Coffee	—	—	—	—
Other	46,063	3,649	113,288	163,000

Based on *U.S. Ports, No.* 17, *Territory of Hawaii* (Washington, 1935).

siderable local trade with other islands in the group. An appreciable portion of the sugar and pineapples from other islands is exported through Honolulu. Large quantities of fertilizer and other goods imported into Honolulu are re-exported to the rest of the group. The table on p. 399 shows the average annual trade figures of the port during the ten years ending in 1933 and gives a picture of the material handled.

Hilo (lat. 19° 45′ N, long. 155° 05′ W approx.)

Hilo is a small port (Fig. 121) at the head of Hilo bay on the east coast of Hawaii about 20 miles north-westward of cape Kumukahi. It consists of an outer anchorage in the bay flanked by Pepeekeo point in the north and Keokea point in the east, and an inner harbour,

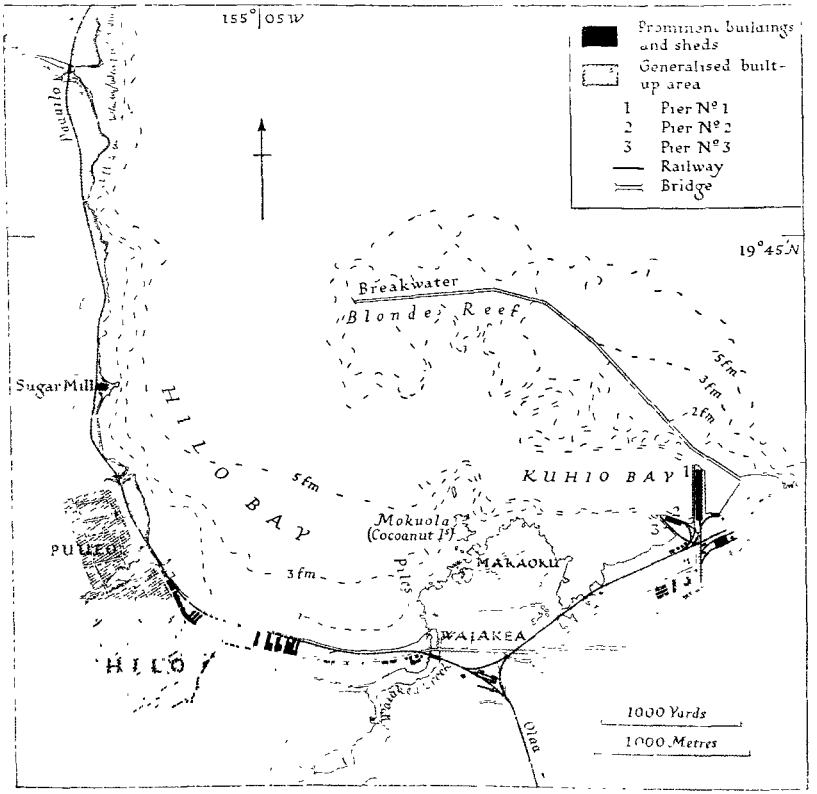


Fig. 121. Hilo

Principal roads only are shown. Built-up areas generalized to include dwellings in gardens. Based on U.S. Coast and Geodetic Survey chart no. 4103.

Kuhio bay, which is partially protected by a breakwater projecting 6,220 ft. from the southern shore over shoals known as Blonde reef. The town of Hilo, with a population of about 19,000, is the administrative centre of the island. After Honolulu, Hilo is the largest town in the group. Liners and inter-island steamers use the port. It is a regular port of call for the Matson Line passenger service from Honolulu to San Francisco, the Los Angeles Line, and the Charles Nelson Line of lumber ships to Puget sound.

Inner Harbour. The inner harbour is reached through a wide channel round the breakwater with a depth of 36 ft. in 1931. The southern half of the harbour, with a length of 4,800 ft. and width of 700 ft., has a depth of about 36 ft. The mean tide range is 2·3 ft. and and extreme range 3·2 ft.

Wharves. There are two wharves. The larger, No. 1, runs due north from a point about 300 yd. west of the end of the breakwater. It is of pile and concrete construction with a length of 1,200 ft., a width of 180 ft. and a depth alongside of 32 ft. according to American sources. On this wharf are a transit shed, and four railway tracks, five electrically operated conveyers for loading sugar, an 8 in. diameter molasses line, 10 in. diameter oil line for bunkering, and an 8 in. water line.

Wharf No. 2, of concrete construction throughout, and projecting at an angle of about 60° from No. 1, is a roughly triangular structure rebuilt between 1926 and 1927. The inner portion along the site of the old pier has a space of 528 ft., all available for berthing according to American sources. An outer addition constructed at an angle has a length of about 110 ft. and is not in practice used for berthing. The other side of the wharf has a length of 635 ft. Recent *Annual Reports of the Governor of Hawaii* refer to the construction of a third 'pier'. This is the west side of No. 2 wharf. Particulars of wharves, berthing space, depth alongside, etc., are as follows:

		West Wharf (Piers Nos. 2 and 3)		
	East Wharf (Pier No. 1)	N.E. side (Pier No. 2)	Extension	W. side (Pier No. 3)
Length	1,180 ft.	528 ft.	110 ft.	635 ft.
Berthing space	910 ft.	528 ft.	—	635 ft.
Depth alongside	35 ft.	30 ft.	30 ft.	34 ft.
Capacity per sq. ft.	500 lb.	500 lb.	500 lb.	500 lb.
Sheds	1,075 × 154ft. 1 floor	377 × 77 ft. 1 floor	—	—

Based on U.S. War Department, Corps of Engineers, *Port Series, No.* 17, *The Ports of the Territory of Hawaii*, p. 93 (Washington, 1935).

There are standard-gauge railway tracks on both wharves, and oil storage tanks on shore behind them. About 6,000 ft. to the west of the wharves is the Waiakea creek which affords shelter for small boats. Oil fuel can be obtained at both wharves, and water in unlimited quantities from the town mains. There are no facilities for under-water repairs, but minor repairs to machinery can be undertaken in the locomotive shops of the railway company.

The town of Hilo (Plate 78) is situated on the shore west of Waiakea creek and has a power station, hotel facilities and an isolation hospital with fifty beds.

Communications. The railway tracks on the wharves are connected with the system which serves the east coast of Hawaii (p. 417), and the Federal Highway which encircles the island provides easy road communication with most parts of Hawaii.

Trade. Although far smaller than Honolulu, Hilo has a considerable overseas trade. This is mostly made up of sugar and molasses which are exported direct to the United States, and of cattle food, fertilizers and petroleum products, chiefly imported direct from America. In 1933, 13,466 short tons were imported from foreign countries, 131,334 from the United States, and 23,807 from other islands. There were no exports to foreign countries that year, but 225,406 short tons were shipped to the United States and 885 to other islands in the group.

KAHULUI (lat. 20° 54′ N, long. 156° 28′ W approx.)

Kahului (Fig. 122 and Plate 79) is a small artificial harbour protected by breakwaters in the bay on the north side of the isthmus joining the two halves of the island of Maui. It is the best port in the island, and recent additions have been made to serve the well-developed sugar-growing district inland, and the town of Wailuku. Both ocean-going and local steamers visit Kahului regularly and entry is easy.

Harbour. The harbour is entirely artificial; it consists of an anchorage protected by two breakwaters projecting obliquely from the shore. The east breakwater has a length of about 1,500 ft. and the west a length of about 2,190 ft. The entrance channel between them is about 660 ft. wide with a minimum depth of $5\frac{1}{2}$ fathoms. The anchorage protected by the two breakwaters and in the lee of the east breakwater was dredged in 1939 to a controlling depth of 35 ft. for a length of 2,000 ft., with a maximum width of 1,450 ft.

Wharves. There is a wharf (Pier No. 1) at the foot of the east breakwater and a pier (Pier No. 2) with deep water along the north-east side parallel to and about 800 ft. to the south-west of Pier No. 1. Pier No. 1, used for ocean-going shipping, is a wharf of concrete construction about 1,000 ft. long. About 900 ft. of this length with

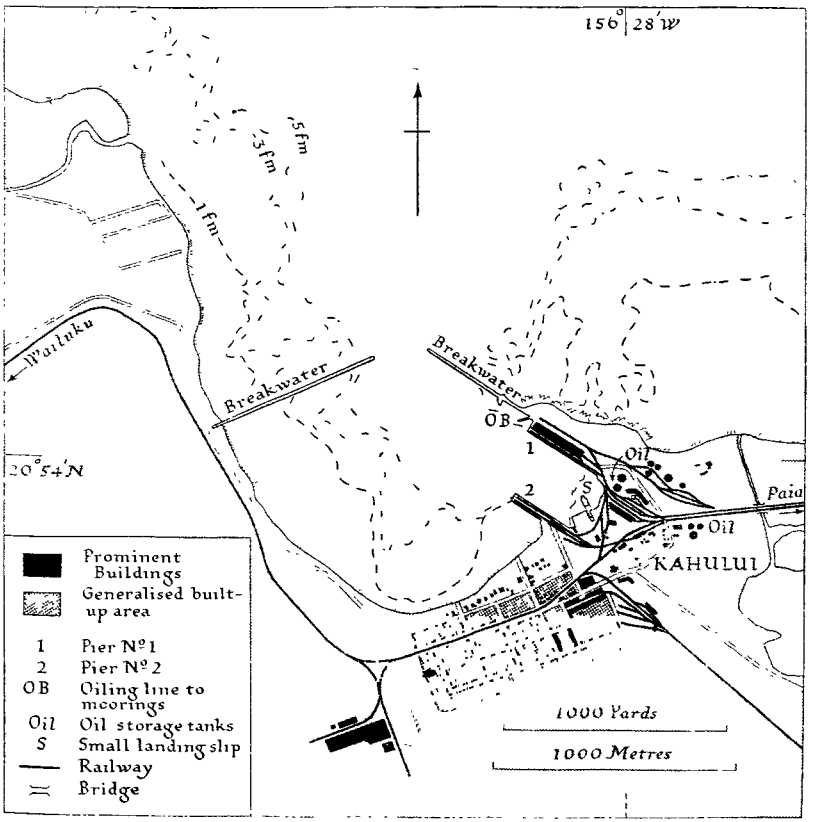


Fig. 122. Kahului

Principal roads only are shown. Built-up area is generalized to include dwellings in gardens. Based on Admiralty chart no. 3534.

a depth of 33 ft. alongside are available for berthing. The wharf is equipped with a shed, mechanical conveyers for loading sugar, pipe-lines for oil, molasses and water, and three railway tracks.

Pier No. 2, which is used primarily for inter-island traffic, has been entirely reconstructed in concrete. It is about 890 ft. long and 102 ft. wide with a berthing space of not less than 627 ft. and a depth

of from 29 to 33 ft. alongside. Sugar conveyers similar to those on Pier No. 1 were ordered in 1930. The total berthing space in the port is not less than 1,517 ft.

Bunkering and Water. Oil fuel is stored in tanks on shore, and in addition to the oil lines on the wharves, facilities are provided for oil by a 4 in. pipe-line from moorings beyond the seaward end of Pier No. 1. There are unlimited supplies of water from the piers connected to the town mains, and vessels at moorings can also obtain water from a barge.

Repair Facilities. There is a small marine railway between the two wharves where vessels drawing less than 6 ft. of water can be hauled up. Minor repairs to machinery can be undertaken by the railway company's machine shops.

Hanapepe Bay (Port Allen)
(lat. 21° 55′ N, long. 159° 36′ W approx.)

Port Allen is the name given to the landing facilities and breakwater on the east side of Hanapepe bay near the middle of the south coast of Kauai (Plate 81).

The bay is about 4,000 ft. across with rocky shores. A breakwater about 900 ft. long has been built out from the eastern side of the bay. Just inside the breakwater the depth of water is about 26 ft., and there is good protection from all winds except *kona* storms. There are no wharves for large vessels to lie alongside, but there are numerous lighters available for loading purposes. The territorial government had prepared plans for the construction of a wharf, but this was suspended while attempts were made to obtain federal assistance. There is a reef half-way between the breakwater and the shore. The Hanapepe river enters the bay at its north-east corner and small boats can enter it at high water.

There are no facilities either for bunkering or repairs but water and provisions can be obtained.

Communications. A narrow-gauge railway and the Federal Highway connect the port with most of the inhabited parts of the island. An airfield is situated near the port.

Trade. In spite of the general lack of facilities Port Allen is the principal port in the island of Kauai. In 1933, a typical year, 36,447 short tons were imported from the United States and 19,794 from other islands. Exports to the United States were 148,511 short tons, and to other islands 206,138 short tons. Imports were mostly petro-

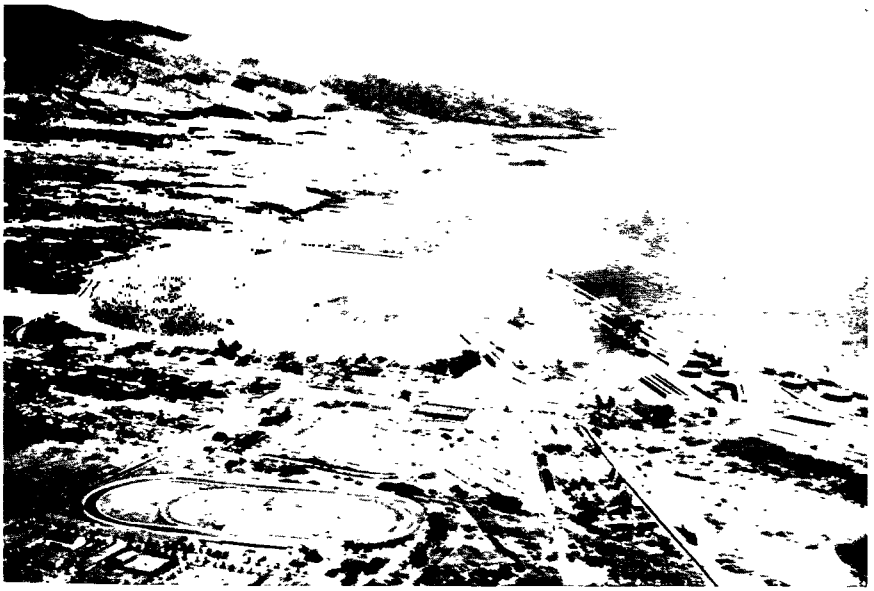


Plate 79. Kahului, Maui

Pier no. 1, where ocean-going vessels moor, lies at the base of the breakwater, pier no. 2, used by inter-island steamers, lies to the left of it.



Plate 80. Mala, Maui

Mala wharf lies about one mile north of the anchorage at Lahaina. The flat lands behind are planted with sugar cane.



Plate 81. Port Allen, Kauai

The coast is fringed with coral reef. Behind the port lie sugar plantations, stretching up to the rugged mountains which constitute most of the interior of the island.



Plate 82. Nawiliwili, Kauai

The wharf lies at right angles to the sea wall, in the centre of the photograph; a pineapple barge is anchored in the harbour. The flat land in the foreground is occupied by sugar cane.

leum products and fertilizers, while exports were principally sugar and pineapples.

NAWILIWILI (lat. 21° 57′ N, long. 159° 20′ W approx.)

Nawiliwili (Plate 82) is a small harbour protected by a breakwater at the west end of a bay at the mouth of the Huleia river, on the south-east coast of Kauai. It is of recent development, being built between 1924 and 1929. It is the second port in the island and it is visited by both ocean-going and local steamers. Entry is difficult for large vessels in high winds, since there is an awkward reverse turn round a breakwater and sea wall.

Harbour. The outer bay between Ninini point to the north and Kawai point to the south is about a mile and a quarter wide and about 3,000 ft. long with a depth of from 7 to 9 fathoms, and provides a moderately protected anchorage. The shores of both sides of the bay are characterized by rocky bluffs with occasional beaches. A breakwater projects from Carter point at the southern end of the inner bay for a distance of 1,830 ft. From the north side of the bay, but inshore of the breakwater, a sea wall projects a considerable distance so as to overlap the breakwater and to surround a patch of reclaimed land.

The entrance channel between the breakwater and Kukui point is dredged in the middle to a depth varying between $5\frac{3}{4}$ and $6\frac{1}{4}$ fathoms. The distance between these points is about 1,100 ft. Vessels entering must turn to port to clear the end of the sea wall which is about 1,200 ft. to the west of the end of the breakwater, and on clearing this must turn to starboard to reach the wharf.

The inner harbour has been dredged to a minimum depth of 5 ft. in the eastern portion, but the western portion of the harbour as shoals about 3 ft deep.

The dredged space inside the breakwater and sea wall is limited to north-south length of about 2,000 ft. and an east-west length of bout 1,200 ft., so there is little room to manœuvre or anchor.

Wharf. A wharf lies along the north shore of the harbour at right ngles to the sea wall. In 1930 the wharf, equipped with a molasses pe-line, was 435 ft. long with a depth of 27 ft. alongside, but erations were in progress to increase the length to 1,000 ft. By 935 the extension had been completed, giving the wharf an actual ength of 984 ft. Oil and water can be obtained from the wharf, but there are no repair facilities.

Communications. A narrow-gauge railway links the port with Lihue, about 2 miles distant, and most of the plantations on the east coast. In addition, the Federal Highway, serving the whole of the southern and eastern districts of Kauai, has a spur running from Lihue to Nawiliwili.

Trade. Nawiliwili, which has only been developed during the last eighteen years, handles only about a quarter as much trade as Port Allen and most of it is of an inter-island character, but the better facilities available should attract far larger quantities in the future.

Minor Ports

Island of Hawaii

Kailua bay (lat. 19° 38′ N, long. 156° W approx.)

Kailua bay is an indentation on the west coast of Hawaii with a small landing stage on the north side of the bay with 3 ft. of water alongside. It is visited by local steamers which lie offshore to load cattle. Supplies of water and oil can be obtained from tanks on the shore. In 1937 the federal government made a grant towards the construction of a concrete pier. It is uncertain whether this has been completed. Formerly cattle were compelled to swim out to the steamers for loading. It is also a local fishing resort, where launches can be hired.

There is a good anchorage protected from the prevailing trade winds but exposed to *kona* storms.

Kawaihae (lat. 20° 02′ N, long. 155° 50′ W approx.)

Kawaihae, on the west coast of Hawaii about 10 miles south of Mahukona, is a bay about 8 miles across. It is fully exposed to *kona* storms but has a landing protected by a fringing reef which projects about 1,000 yd. from the shore. It is normally used only by local steamers which call to load cattle. About 8,000 head are shipped annually to Honolulu. There is a small open shed at the shore end of the landing, and protection for small boats inside the reef. Steamers can anchor outside the reef and to the west of the landing in from 7 to 8 fathoms of water and pass stern lines to mooring buoys inshore. In 1935 plans were prepared for the construction of a new wharf.

Kealakekua bay (lat. 19° 29′ N, long. 155° 56′ W approx.)

Kealakekua bay, 10½ miles south of Kailua on the west coast of Hawaii, is 2 miles wide and 1 mile long. There is a concrete wharf

with a depth of 6 ft. alongside. It is visited by local steamers but it is little used as a shipping point except for coffee and tobacco. The bay is easy of access and well protected from all but *kona* storms and provides the best anchorage on the west coast of Hawaii. On the east of the bay is the small village of Napoopoo. Provisions may be obtained in small quantities but water is scarce. It is interesting historically as being the scene of the death of Captain Cook.

Honuapo (lat. 19° 05′ N, long. 155° 33′ W approx.)

Honuapo, on the south-east coast of Hawaii 13 miles north-east of Kalae point, is used to land supplies of oil for local mills and as the principal export point for sugar on the south-east coast of Hawaii. Traffic formerly passed through Punaluu, 4½ miles to the north-eastwards, but this has now been abandoned as a port, and Honuapo is used instead. Oil tankers call occasionally and local steamers regularly. In 1931 plans were considered to use Honuapo as a port for the direct shipment of sugar to the mainland.

The landing has a depth of about 23 ft. at its outer end, but ships do not come alongside; they drop anchor and run lines to mooring buoys. Freight is handled by lighters. On the shore to the north of the landing are five oil tanks and two molasses tanks.

Mahukona (lat. 20° 11′ N, long. 155° 54′ W approx.)

Mahukona is a small anchorage in an open bight about 5½ miles south of Upolu point in the north of Hawaii, on the lee side of the Kohala range. It is unprotected and subject to strong offshore winds during the trade wind season. It is used primarily for the export of sugar from the plantations in the north of the Kohala district. Ocean-going and local steamers call regularly.

There are two landings, but vessels anchor or moor offshore and loading is undertaken by lighter. Normal landing procedure is for vessels to make fast to bow and stern mooring buoys of which there are three pairs west of the north landing. Even when moored vessels are exposed to such wind that they should be ready to let go both anchors at a moment's notice.

The southern landing, owned by the territorial government, is equipped with a winch and surf lines by which sugar barges are hauled to and from ships at the mooring buoys. The northern landing, privately owned, is equipped with a derrick. A railway line connects the port with plantations in the north of Hawaii.

Island of Molokai

Kamalo harbour (lat. 21° 03′ N, long. 156° 53′ W approx.)

Kamalo harbour, on the south coast of Molokai, about 12½ miles westward from cape Halawa, is a pocket in the fringing reef with an opening to the south, and with a pier projecting into deep water. Pineapple barges load at the pier and the local steamer calls regularly. It is the only safe harbour on the south coast of Molokai in *kona* weather.

The entrance is through a channel about 150 ft. wide over a bar with a general depth of 14 ft., but it is possible to carry 19 ft. by steering midway between the two entrance buoys. The harbour, which is flanked on both sides by a reef which dries out at low tide, has a length of about 3,500 ft. and a width of not less than 500 ft. The depth is mostly over 30 ft. The pier projects from the shore for a distance of about 600 ft. and has a face of about 100 ft. against which small vessels can berth.

Kaunakakai (lat. 21° 05′ N, long. 152° 02′ W approx.)

Kaunakakai is a pocket in the reef of the south side of Molokai, 9 miles west of Kolo harbour. There is a long mole projecting from the shore. It is used primarily for the export of pineapples to Honolulu and is visited regularly by the inter-island steamers. During *kona* storms, heavy waves are said to sweep over the mole. Owing to the growth of the pineapple industry, considerable improvements were undertaken in 1936 and further measures were in contemplation in 1938.

The harbour was dredged in 1934 to give a depth of 23 ft. over a rectangular area about 600 ft. wide and about 1,500 ft. long. The mole, about 2,000 ft. long and surmounted by a road 18 ft. wide, projects from the shore in a south-westerly direction to the dredged area where it terminates in a quay with a face about 500 ft. long. In 1936 a contract was placed for widening and paving this mole.

Kolo harbour (lat. 21° 05′ N, long. 157° 12′ W approx.)

Kolo harbour, on the south coast of Molokai about 6¾ miles eastward of Laau point, is a pocket in the fringing reef connected to the shore by a jetty. It is used as a shipping point for pineapples produced in the west of Molokai.

Entry is through a channel 200 ft. wide with a depth of 9 ft., so it is only accessible to small craft. There is ample room for anchorage

inside the reef in from 6 to 8 ft., but the harbour is dangerous in *kona* storms. The jetty projects about 700 ft. from the shore into 8 ft. of water with about 180 ft. berthing space on each side.

Island of Maui

Hana bay (lat. 20° 46′ N, long. 155° 59′ W approx.)

Hana bay is a small inlet, five-eighths of a mile in diameter, between Kauiki head and Nanualele point on the extreme east of Maui. It is exposed to the force of the north-east trade winds but was economically important as providing the only outlet for the produce of the eastern end of Maui, which has only recently been connected by good roads with the rest of the island. Both ocean-going vessels and the local steamers call regularly to load sugar and cattle, and to land supplies and equipment.

The bay is flanked on the south by the high cliffs of Kauiki head and on the north by the low headland of Nanualele point. To the west is the village of Hana. A shoal extends about half-way across the bay from the north side. Entry is effected between this and a pinnacle rock about 800 ft. to the south-east through a channel 30 ft. deep and 300 ft. wide. There is a concrete wharf 240 ft. long with a minimum depth of 21 ft. alongside. The shore is generally rocky. Only small craft can find anchorage in the south-west part of the bay.

Lahaina (lat. 20° 52′ N, long. 156° 41′ W approx.)

Lahaina, on the west coast of Maui and about 8½ miles south of Kaanapali, is an open anchorage in the lee of the island and protected from trade winds but exposed in *kona* weather. The shore is a sandy beach fringed by a reef. There is a landing for small boats opposite a passage in the reef, and about a mile north of Lahaina on the north side of Puunoa point is a modern concrete wharf, known as Mala wharf, 960 ft. long with depths alongside of 24–25 ft. Unfinished works make the end of the wharf (32 ft. depth) unusable, and currents make the approach to the wharf difficult at times.

In the middle of the nineteenth century Lahaina rivalled Honolulu as a base for whalers, but it is now little more than a village (Fig. 126, Plate 80).

Kaanapali (lat. 20° 56′ N, long. 156° 42′ W approx.)

Kaanapali is an open anchorage on the extreme west of Maui, about 4½ miles north of Lahaina, with a landing. In trade wind weather

the anchorage is protected by the island, but in *kona* weather there is no protection. It is, however, the shipping point for most of the produce of the west coast of Maui. Ocean-going vessels call regularly as well as local steamers, and the landing is the terminus of a local railway serving the west coast. The shore is sandy except for the cliffs of Kekaa head on the south side of the bay. Anchorage is in from 10 to 20 fathoms.

The landing is immediately to the north of Kekaa head and consists of a wharf with a depth of from 4 to 5 ft. alongside. There are mooring buoys about 300 yd. off Kekaa point in 15 fathoms.

Island of Lanai

Kaumalapau (lat. 20° 47′ N, long. 156° 59′ W approx.)

Kaumalapau (Plate 84), on the west side of Lanai about $3\frac{1}{2}$ miles north of cape Kaea, is a small bight at the mouth of a river partially protected by a breakwater extending 100 yd. from the northern side of the bight. A wharf inside the bay has a depth of 28 ft. of water alongside, but the harbour is too small for the use of large vessels. The port was developed quite recently to provide a shipping point for pineapples grown on Lanai, which are transported in large barges to Honolulu.

Island of Kauai

Hanalei bay (lat. 22° 55′ N, long. 159° 31′ W approx.)

Hanalei bay, on the north coast of Kauai, is a semicircular indentation in the coast a mile wide. Both sides are fringed by coral reef but there is a sandy beach at the head of the bay (Plate 83). There is a small landing with 6 ft. of water alongside and the depth in the bay varies from 3 to 8 fathoms. The anchorage is good, providing shelter from all except north winds. The development of land communications and the facilities of other ports in the island have reduced the importance of the landing.

Hanamaulu bay (lat. 21° 01′ N, long. 159° 20′ W approx.)

Hanamaulu bay is an indentation about 1,000 yd. long and 500 yd. wide on the east coast of Kauai, 3 miles north of Nawiliwili bay. The greater part of the bay is shallow but is sheltered by steep hills from all except north-easterly winds.

There is a landing at Ahukini on the south-east side of the bay, used chiefly for the export of sugar and pineapples. There is a wharf



Plate 83. Hanalei bay, Kauai

The bay was formerly a shipping point of some importance, but is now visited by inter-island steamers only occasionally.

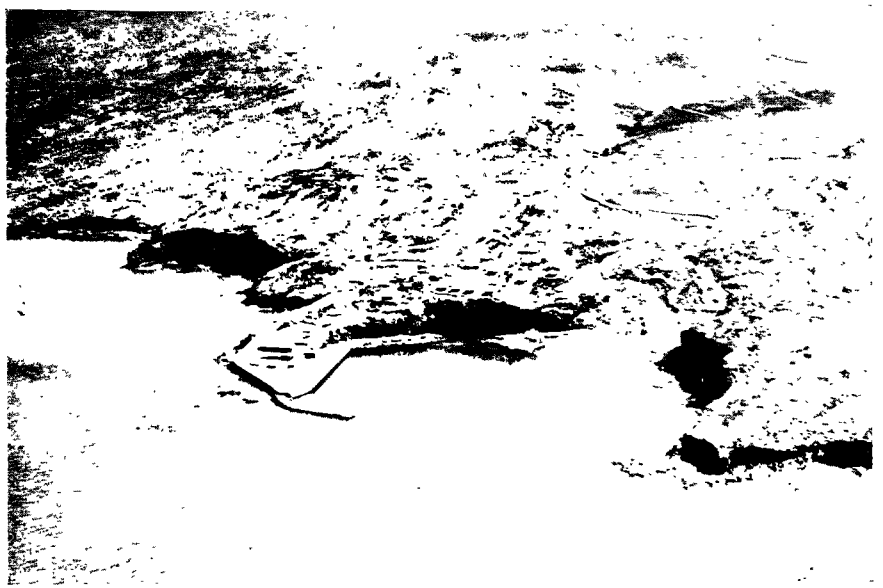


Plate 84. Kaumalapau harbour, Lanai

This harbour, the shipping point for the pineapple plantations in the middle of Lanai, has been developed with some difficulty; the zigzag road winding inland is the only means of land communication.

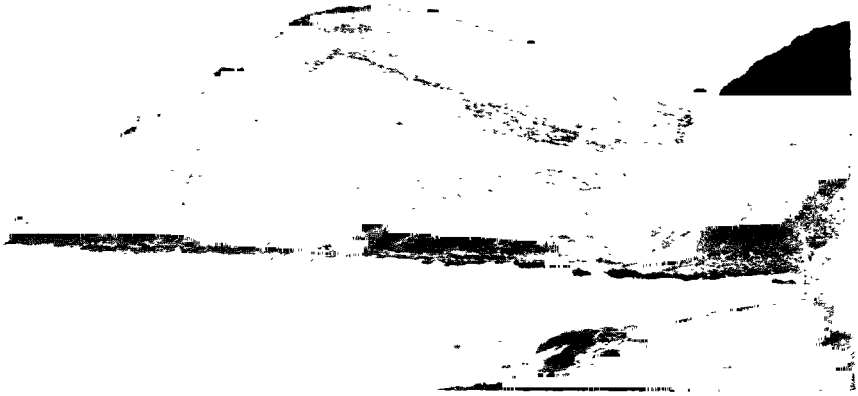


Plate 85. Makapuu point, Oahu

This bold headland, with a light on the point, is the most easterly cape of Oahu.



Plate 86. Kaena point, Oahu

This is the most westerly cape of Oahu. Both road and railway run round the point, and their situation indicates the difficulty of communications round much of the island.

with a length of 210 ft. and a depth of 34 ft. alongside. In rough weather there is a heavy swell in the harbour. Behind the wharf are a warehouse and oil tanks. Water, fuel oil and gasoline can be obtained, but water is scarce.

BIBLIOGRAPHICAL NOTE

The following works give a good general picture of Hawaii:

William H. Haas (Editor), *The American Empire* (Chicago, 1940), contains a good general account of all American possessions including the Territory of Hawaii. Clifford Gessler, *Hawaii, Isles of Enchantment* (London and New York, 1937), although written for the popular reader, gives a very fair and accurate idea of Hawaii. Others are an American government publication by the U.S.A. Department of Interior, *General Information regarding the Territory of Hawaii* (Washington, 1937); Stephen B. Jones, 'Geography and Politics in the Hawaiian Islands', *Geographical Review*, vol. XXVIII, pp. 193–213 (New York, 1938); Stephen B. Jones and Klaus Mehnert, 'Hawaii and the Pacific', *Geographical Review*, vol. XXX, pp. 358–73 (New York, 1938); Honolulu Star-Bulletin Standard Tourist Guide, *All about Hawaii* (Honolulu, 1937).

R. W Robson (Editor), *The Pacific Islands Year-Book* (Sydney, 1939), and the *Annual Reports of the Governor of Hawaii to the Secretary of the Interior* (Washington, 1921–40), in particular give information of a statistical character. Various articles in *Paradise of the Pacific* (Honolulu, 1920–40), a monthly periodical, are generally of a popular nature but contain useful information and throw light on those subjects which are treated only statistically elsewhere. The *Hawaiian Annual* (Honolulu, 1853–) contains general information and local statistics.

The physical geography of the group as a whole is dealt with by the following:

William Alanson Bryan, *Natural History of Hawaii* (Honolulu, 1915); Otis W. Freeman, 'Economic Geography of the Hawaiian Islands', *Economic Geography*, vol. V, pp. 260–76 (Concord, 1929); Admiralty, *Pacific Islands Pilot*, vol. III (6th edition, London, 1931, with supplement to 1941); U.S. Coast and Geodetic Survey, *United States Coast Pilot, The Hawaiian Islands* (Washington, 1933, with Supplement to 1942).

More detailed studies, dealing primarily with individual islands but with general reference to the group as a whole, are to be found in the *Bernice Pauahi Bishop Museum Bulletins*. A list of those relevant will be found at the end of chapter X. Weather is dealt with at some length by Stephen B. Jones, 'The Weather Element in the Hawaiian Climate', *Annals of The Association of American Geographers*, vol. XXIX pp. 29–57 (Lancaster, Pa. 1939), and by Stephen B. Jones and Rolland Bellaire, 'The classification of Hawaiian climates', *Geographical Review*, vol. XXVII, pp. 112–15 (New York, 1937).

The history of the group is covered in an elementary form by R. T. Kuykendall, *A History of Hawaii* (New York, 1926), and in more detail and with particular reference to the sugar industry and land tenure by Jean Hobbs, *Hawaii, a Pageant of the Soil* (Stanford University and London, 1936). The earlier history has been dealt with comprehensively by R. T. Kuykendall, *The Hawaiian Kingdom*, 1778–1854 (Honolulu, 1938).

For population the chief source is U.S. Bureau of Census, *Census Returns*, 1930; further information is contained in the *Annual Reports of the Governor of Hawaii* (see above). Peoples are dealt with by Romanzo Adams, *The Peoples of Hawaii* (Honolulu, 1933), which gives a general picture of racial admixture and

the growth of the mixed population. Ernest Beaglehole, 'Some Modern Hawaiians', *University of Hawaii Research Publication*, No. 19 (Honolulu, 1937), is a detailed study of the modes of life of the various ethnic groups in the territory and their attitudes towards one other.

For the study of administration and the constitutional position, a comprehensive yet compact work is Robert M. C. Littler, *Governance of Hawaii* (Stanford University, 1929). *The Annual Reports of the Governor of Hawaii* are also useful.

Economics are covered comprehensively by Andrew W. Lind, *An Island Community* (Chicago, 1938); J. W. Coulter, *Land Utilization in the Hawaiian Islands* (Honolulu, 1933); U.S.A. Department of Labor, 'Labor in the Territory of Hawaii, 1939', *Bulletin*, No. 687 (Washington, 1940).

A work dealing specifically with ports is a publication by the U.S. War Department, Corps of Engineers, *Port Series, No. 17, Ports of the Territory of Hawaii* (Washington, revised edition, 1935). This is exhaustive up to 1934 but should only be used in conjunction with the Governor's *Reports*, Admiralty and American Sailing Directions, and recent charts, to give an up-to-date picture.

For maps see Appendix I.

Chapter X

INDIVIDUAL ISLANDS OF THE HAWAIIAN GROUP, AND JOHNSTON ISLAND

Windward Islands: Leeward Islands and Johnston Island: Bibliographical Note

WINDWARD ISLANDS

HAWAII

The island of Hawaii, the largest and the most easterly of the group, lies between lat. 18° 56′ and 20° 16′ N, and long. 154° 48′ and 156° 04′ W. It has an area of 4,015 sq. miles and is roughly triangular in shape.

Structure

The island is formed of five volcanoes of varying ages: the Kohala range forming the northernmost peninsula of the island, Mauna Kea (13,825 ft.), Hualalai (8,269 ft.), Mauna Loa (13,675 ft.) and Kilauea (4,090 ft.). The four latter form a rectangle covering the whole of the southern part of the island and are connected with the Kohala range in the north by the high Waimea plateau.

Kohala is older and in consequence much more eroded than the other mountains especially on the windward side, where the hillside has been dissected into deep gulches and canyons reaching to the sea. In many parts of the western or leeward slopes of the range are traces of cinder cones. The whole of this side of the range is dry and comparatively barren.

The four remaining volcanic domes, which have an even, gently rounded shape, have been little eroded. On the windward side gorges have been cut back some distance from the coast. Many of the more recent terminate as hanging valleys half-way down the cliffs. The leeward slopes, where there is little rainfall, are barren and smooth.

The extinct Mauna Kea rises gently from the coast, with numerous cinder cones on the summit, which is bare of vegetation and snow covered in winter. On the wetter windward side, the forest zone reaches to within about 1,000 ft. of the summit, while on the lee side vegetation stops short at about 7,000 ft.

Hualalai, also extinct and topped with numerous cones, is rough and barren. On the north side the lower slopes of the mountain are wooded, but the south side is free of trees.

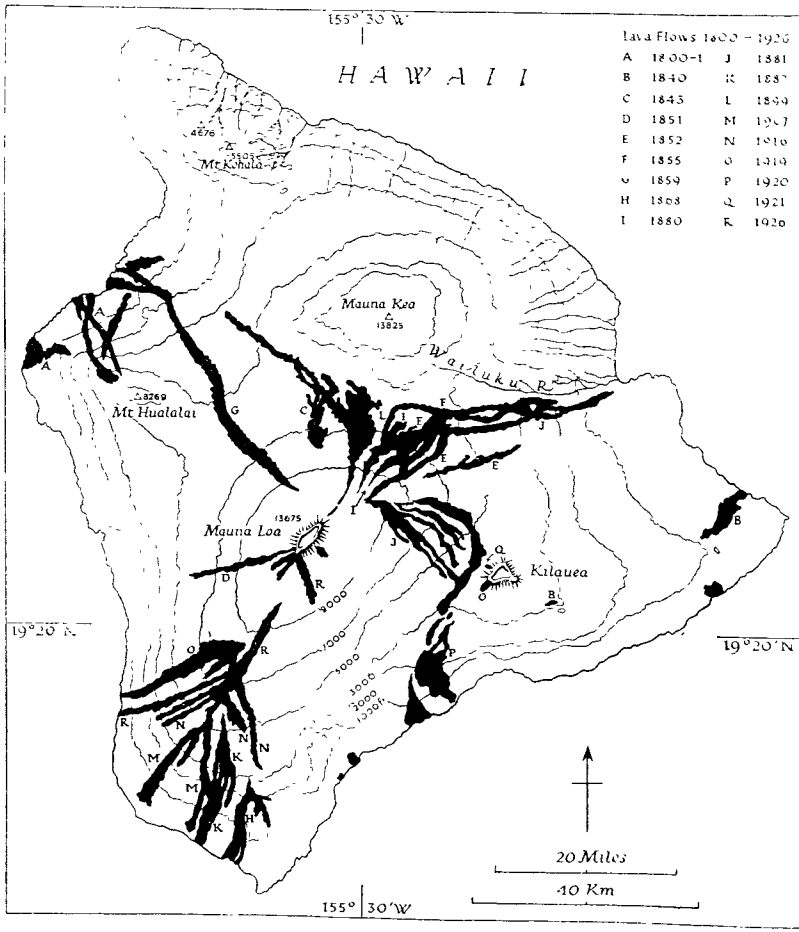


Fig. 123. Hawaii: physical

Showing (in black) approximate extent of lava flows, 1800–1926. Contours above 9,000 ft. not included. Based on: (1) U.S. Coast and Geodetic Survey chart no. 4115; (2) U.S. Navy Aviation chart no. V. 450; (3) U.S. Geological Survey 1 : 62,500 topographic series of Hawaii, 1915–32.

Mauna Loa, which is still active, resembles Mauna Kea in general form, but the summit, in contrast, consists of a vast crater from which lava has issued at various dates in the last century (Fig. 123). The whole

mountain side is scarred with lava flows which radiate in all directions from the crater, many even reaching the sea. The more recent flows from Mauna Loa occurred in 1920, 1921, 1926, 1936, 1941. The flow of 1926 wiped out the village of Hoopuloa on the Kona coast. That of 1936 threatened to overrun the port of Hilo, but the flow was successfully diverted by bombing from the air.

Kilauea, which flanks Mauna Loa on its east side, is really an independent volcano. Owing to the weakening of the hillside by some internal explosion lava does not now overflow the crater, but on occasions breaks out at lower levels. Consequently the eastern portion of Hawaii is freer from lava flows and less scarred than the south-west.

The area to the south-east of Kilauea, the Kau desert, is barren and studded with subsidiary cinder cones.

Coast

The coast is generally even and with few deep indentations. Occasionally on the east side of the island streams have cut their way through the rocks making small coves or gulches. The southern end of the north-east coast between cape Kumukahi and Hilo is low, and backed by a plain rising gently to the lower slopes of Kilauea. North of Hilo the coast consists of cliffs intersected by gulches, but with few natural landings. The hinterland forms a tableland rising gently to merge imperceptibly into the mountain of Mauna Kea. The northern part of this coast consists of very high steep cliffs characterized by hanging valleys from which waterfalls plunge straight into the sea.

The west side of Hawaii is characterized by numerous bluffs and formed by lava flows reaching the sea. Between the scorched and barren flows there are areas with considerable vegetation, including palm trees. Small beaches occur occasionally. There are no large bays or estuaries providing good harbours, and coral reefs occur frequently off the flatter portions of the coast, sometimes stretching out as much as 1½ miles. No anchorage on this coast is safe in *kona* weather. The north part of this side of the island, in the lee of the Kohala range, is relatively flat, consisting of a low coastal plain, from which rise scattered cinder cones and lava flows. Farther south, this plain rises gently to merge with the slopes of Mauna Loa and of Hualalai. A characteristic of the settlements along this coast is for a few houses to stand near the shore, while the majority of the village is some 2 miles inland on the main road.

The south-east side of the island is similar in character, especially towards its western end, with lava-flows coming down to the sea and forming headlands. The eastern half of this coast consists largely of steep wooded bluffs which are backed by the barren Kau desert.

Ports, Anchorages and Landings

On the east coast, fully exposed to the force of the north-east trade winds, there are no natural harbours apart from Hilo (p. 406). In former times there were several cable landings. At these points freight was hauled over cables running from mooring buoys to winding machinery at the top of the cliff. Anchorages are few and exposed. There are cable landings at Paauhau, where there is also an indifferent anchorage in from 6 to 9 fathoms, with a small boat landing, and at Kukuihaele. Other landings are at the mouths of the Waimanu valley and Waipio gulch, with anchorage in about 7 fathoms and facilities for small boats.

The most important landings on the west coast are at Mahukona (p. 407) in the north, Kailua bay in the middle and Kealakekua bay (p. 406). But all along the coast are minor landings used chiefly by local steamers. Nowhere along this coast can ocean-going vessels come alongside a quay. Small boats usually go alongside the landings and in places cattle stagings have been built. The only landing where steamers call on the south coast is Honuapo (p. 407).

Social and Economic Conditions

The principal industries of the island are sugar cultivation and ranching. Sugar plantations are located mostly along the north-eastern (windward) seaboard where the rainfall is heavy. The dry interior is either reclaimed as forest reserve or used for grazing land. Along the dry west coast is the coffee-growing district of Kona.

The only town of any size in the island of Hawaii is Hilo, with a population of about 19,000. It is the second port in the territory (p. 400), has a power station, and a sugar mill. The administrative offices of the county government are situated here and there is a prosperous suburban area at Puueo. The remaining settlements are small villages or plantation establishments consisting usually of a sugar mill round which are clustered the houses of the plantation workers. The villages are mostly grouped along the sugar-growing north-east coast, and along the western or Kona coast. Many have simple facilities for landing small cargoes. The interior is almost unpopulated. Hotels have been built at Hilo and Paauilo, on the

north-east coast, Hawi in the extreme north of north Kohala, Waimea at the south end of the Kohala range, Kailua and Kaawa Loa in the Kona district, Waiohinu and Pahala about 5 miles inland from the south-east coast, and Kilauea near the crater of the volcano.

Communications

Sea communication is maintained by occasional ocean-going vessels sailing direct from Hilo and from Mahukona to American ports, and the inter-island steamers touch at most of the landings on voyages twice a week from Honolulu.

There are two railways open to the public. These are 4 ft. $8\frac{1}{2}$ in. gauge lines. Both feed Hilo. The Hilo Railway runs south for about 20 miles to Pahoa. The other line, the Hawaii Consolidated Railway, runs north along the coast to Paauilo and Kukuihaele. In addition, many of the plantations have their own lines acting either as feeders for the main lines or merely to convey sugar cane to the mills. In the north is a short stretch of railway running round the coast from Niulii to Mahukona.

The general pattern of the roads follows the settlements. A good road, improved under the Federal Aid Highway scheme, circles the island following the east coast from Hilo to Honokaa where it turns west to Waimea, about 15 miles inland. A branch runs north from Waimea to Hawi with feeders to Sueter airfield, Mahukona and places on the north Kohala coast. The main road continues south-westerly from Waimea to within about 5 miles of the west coast which it follows at distances varying between about 2 and 5 miles inshore with feeder roads to the principal villages on the coast. At the extreme south of the island the road runs about 10 miles inland in an easterly direction to Waiohinu and down to the coast at Honuapo. From Honuapo the road leaves the coast, running north-eastwards to the crater of Kilauea and Keaau, whence it turns northwards for about 10 miles to Hilo. A branch of this road runs from Waimea to the National Park on the summit of Mauna Loa. A series of secondary roads runs south from Keaau to the settlements in the south-east of the island.

There are, according to published sources, three airfields in the island: Hilo, Sueter field near Upolu point, and Morse field near Kalae point. The two latter are for service use.

Civilian signal facilities include a W/T station at Hilo, and a telephone system with a network of about 9,000 miles of line linked with other islands by radio telephone.

MAUI

Maui lies between Hawaii and Molokai roughly between lat. 20° 35′ and 21° 02′ N, and long. 155° 59′ and 156° 42′ W. It is separated from these islands by channels 30 miles and 9 miles wide respectively.

Structure

The island has a total area of 728 sq. miles and consists of two volcanic domes joined by a low saddle not more than 150 ft. high and between 6 and 7 miles wide. The eastern dome of Haleakala is much the larger and of more recent date. The western volcano, which probably approximates in age to the island of Kauai, is so deeply cut by gulleys that little of the original form is left. The whole outline of the island formed by these mountains is roughly similar to an hour-glass with one end larger than the other (Fig. 124).

Haleakala rises as an asymmetric dome to a height of 10,032 ft., with a maximum east-west diameter of 32 miles, and a north-south diameter of 25 miles. At the summit is a large irregularly shaped crater-like depression about 8 miles long by 2 miles wide probably caused by subsidence. The steeply sloping walls of this area have a depth reaching to 2,500 ft. and the floor is studded with numerous cinder cones. On the north and south sides are two very large fault gaps. That on the north side is about 3 miles wide and that on the south side 1 mile wide. From these two gaps deep wide valleys run down between steep cliffs to the sea on the north and south of the island. A third but smaller gap in the east runs towards the sea near Hana bay on the east coast.

On the slopes of Haleakala deep gorges have been cut by heavy rains accompanying the trade winds, especially on the north-east coast. Valleys on the south-east and south coasts, though numerous, are far shorter and shallower as a result of the lighter rainfall (Fig. 125). The streams in them are often only intermittent. The west of Haleakala slopes gently to the saddle joining it with west Maui.

The saddle or isthmus is low, rising only to 150 ft., and is covered is part by sand dunes derived from broken-up fragments of coral on the reefs which fringe the neighbouring shore.

West Maui, which rises to mount Puukukui in the centre, is roughly oval in shape, 18 miles long by 12 miles wide. The summit is boggy and characterized by low shrubs, sphagnum moss, and sedges. Deep well-wooded canyons radiate to the coast. These are fed by shallow channels ending in hanging valleys which empty their con-

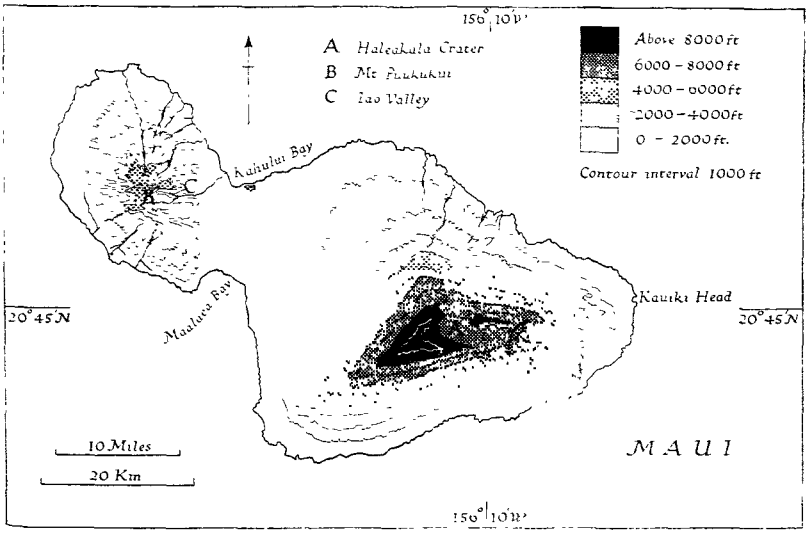


Fig. 124. Maui: relief

Based on U.S. Coast and Geodetic Survey chart no. 4116.

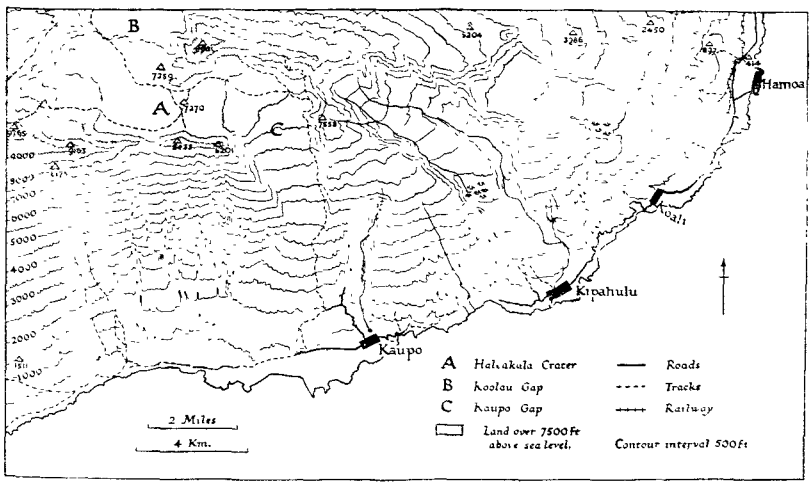


Fig. 125. South-eastern Maui: detail

Land above 7,500 ft. is shaded to emphasize the position of Haleakala crater and the two fault gaps. Based on U.S. Geological Survey 1 : 62,500 topographic map of Haleakala Quadrangle (Maui), 1928.

tents over the precipices forming the sides of the main canyons. The largest canyon is the Iao valley, with precipitous sides rising more than 300 ft. above the valley floor; it runs from near Puukukui to Wailuku.

Coasts

There is little coral off the coast of Maui, but reefs cover the entrance to the bights on each side of the saddle joining the two volcanic domes. The north coast between Hana bay in the east and Pauwela point consists of high cliffs and bluffs interspersed with



Fig. 126. Cultivated slopes behind Lahaina, Maui

The slopes are planted in sugar cane. The eroded volcanic mountains rise behind the clouds to over 5,000 ft. Mala wharf is in the left foreground. Based on a photograph.

small bays where the gorges run down to the sea. The most noticeable of these is the Kaenae valley running from the Koolau gap. The bight round Kahului has a sandy beach. Inland, the country rises gently to the lower slopes of Haleakala.

The coast of western Maui is made up almost entirely in the north of rocky headlands and small bays with occasional sandy beaches at the mouths of the numerous valleys which reach the sea. For some distance north-west and south-east of Lahaina on the west coast of the island a fringing reef lies off the coast and there is a beach. The interior of this part of the coast is comparatively flat. Behind this the land slopes gently to the mountains (Fig. 126). Sand beaches

and fishponds occur to the south of the isthmus near Maalaea. The coast of east Maui between Maalaea and cape Hanamanioa tends to be low and wooded. The south-east coast is in general formed of steep bluffs with occasional beaches. The hinterland tends to be flat, rising gently to the hills, but is interrupted by gulches and occasional cinder cones, some of which actually fringe the shore and have been deeply eroded by wave action.

Ports, Landing and Anchorages

Apart from Kahului (p. 402), which is the only fully protected harbour on the islands, Hana bay and Lahaina, which is a magnificent anchorage except in *kona* storms, there are poor anchorages at various points round the coast. These usually have a short landing stage, or a small concrete wharf for the handling of local traffic. The most important are Hana bay (p. 409) on the east coast, where both local and ocean-going steamers call; Kaupo and Maalaea on the south coast; and Lahaina (p. 409) and Kaanapali (p. 409) on the west coast.

Social and Economic Conditions

Sugar is grown on large plantations in the isthmus region and on small coastal belts in the extreme east of the island. Pineapples are grown on the north-western slopes of Haleakala and on the north-west coast; large areas in the interior are set aside as forest reserves; and the immediate vicinity of the crater of Haleakala has been preserved as a National Park. A belt of mixed farms and homesteads runs north-westward, flanking the road from Keoneoio. Taro is grown in isolated patches at various points along the river valleys. Grazing land occupies most of the southern side of the island and the coast of Haleakala.

Villages and plantations are spread thickly over the isthmus area and a few plantations are scattered along the extreme western and eastern coasts of the island.

There are no large towns in Maui. It is doubtful if any settlement has more than about 1,500 people. The majority of the villages are plantation settlements built round the nucleus of a sugar mill or a pineapple cannery. Wailuku on the west side of the isthmus, a few miles south of the port of Kahului, is the administrative centre of the island. Lahaina on the west coast is a comparatively large village stretching along the coast for about 2 miles with a landing at Mala. For a short time during the reign of Kamehameha I, Lahaina was the

capital of the whole kingdom of Hawaii. The remaining settlements of importance are Spreckelsville, Paia and Haiku on the lower slopes of the eastern side of Haleakala. Hana is the principal village in the eastern coastal belt of cultivation.

Communications

Occasional ocean-going vessels visit Kahului and Hana bay and inter-island steamers maintain a daily service with Honolulu except on Saturdays.

Railways with a gauge of 3 ft. join Wailuku with the port of Kahului and run along the coast to Spreckelsville, Paia and Haiku. In addition, there are numerous plantation railways feeding Kihei and Kahului, and another serving the isolated plantation area lying along the coast to the north and south of Hana.

Roads are well developed in the isthmus region, and round most of the coast of west Maui. There are good roads following the coast between Hana and Kipahulu and along the north-east coast. Owing to the hilly and difficult nature of the country the villages of Kaenae and Wailua on the north coast were formerly cut off from the main road system in the isthmus to the west and the road system in the east. But a road has now been constructed between Pauwela and Hana linking up these regions. Kaupo on the south-east coast is similarly isolated. There is a stretch of about 20 miles on the south coast which is only linked by rough tracks.

A Federal Highway runs from Lahaina round the south coast to Maalaea, and north from there to Wailuku and Kahului. It then continues in an easterly direction to a point south of Makawao, and turns south and ultimately south-west through a mixed farming area to Keoneoio. A spur leads up to the National Park.

There were in 1930, according to published sources, two airfields, Maui airport to the north of Maalaea and Hamoa to the west of Hana bay. There is a telephone system linking all parts of the island. This system is connected to other islands of the group by wireless telephony.

MOLOKAI

The island of Molokai, lying roughly between lat. 21° 02′ and 21° 14′ N, and long. 156° 43′ and 157° 19′ W, is $7\frac{1}{4}$ miles north-east of Maui, and separated from it by Pailolo channel. It is a long narrow island lying east and west; roughly rectangular in shape, with a width of between 7 and 10 miles and a length of about 34 miles (Fig. 127).

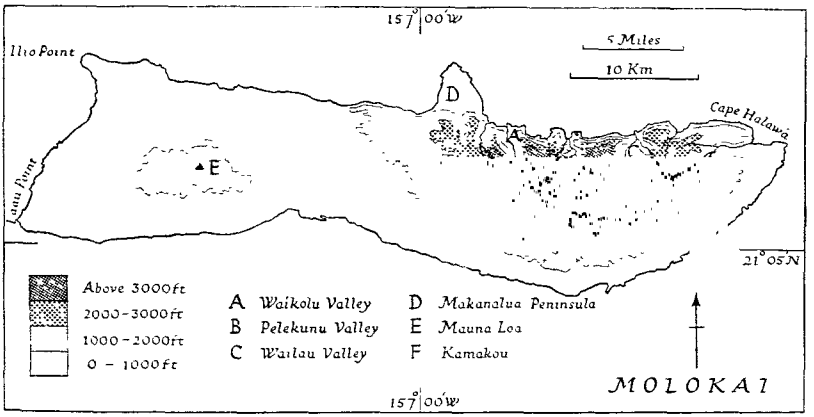


Fig. 127. Molokai: relief

Based on U.S. Geological Survey topographic map of Molokai, 1924.

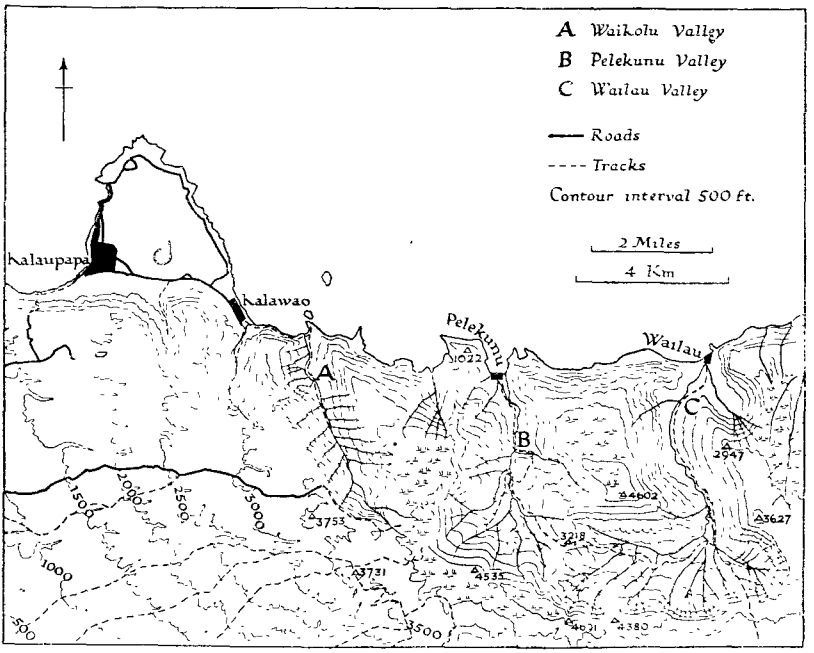


Fig. 128. North-east coast of Molokai: detail

The steep-sided valleys make communication extremely difficult. Kalaupapa is the principal leper settlement in the Territory of Hawaii. Based on the same source as Fig. 127.

Structure

It is formed like Oahu and Maui of the domes of two volcanoes, an older western one and a rather more recent eastern one. On the western mountain, Mauna Loa (1,400 ft.), the land slopes gently seaward from a bare tableland cut up into narrow gulches. The plain between the mountains is low and rolling, with a maximum elevation of about 500 ft. The eastern half of the island formed by Mt Kamakou, which rises to 4,970 ft., is very different, being wild and rugged. The highland area includes a wet bog forest. Northwards this type of terrain stretches to the coast and ends in steep wedge-shaped hills and cliffs. Short amphitheatre-like valleys have been cut down from the summit practically to sea level. The Wailoku and Pelekunu valleys are surrounded on their landward side by high almost inaccessible cliffs caused by subsidence (Fig. 128). To the eastward another deep canyon, the Halawa valley, runs between precipices to the sea at Halawa bay. The whole area of the highlands of Mt Kamakou is almost impenetrable. It is intersected in every direction by steep cliffs and overgrown with tangled vegetation through which it is necessary to cut a way with a knife. Southward the slope is gentle, but deeply dissected by short gulches. These terminate some distance from the coast, giving a comparatively flat coastal margin.

Coasts

Along the whole of the south coast is a fringing coral reef extending up to about a mile from the shore. The western part of this coast between Laau point and Pukoo is characterized by sandy beaches, but to the eastwards the coast is rocky, and much cut up by ravines near the east end of the island.

On the eastern half of the north coast the mountains fall sheer away into the sea except where they are cut up by deep valleys and ravines. Landing is difficult even in the small bights, access to the interior is almost impossible and there are no anchorages. The site of the leper colony on the Makanalua peninsula is a flat shelf or platform fringed by a sandy beach several miles long, with occasional low wave-cut cliffs. West of the Makanalua peninsula the coast continues as a line of cliff for about 8 miles. The west coast from Ilio point to Laau point consists mostly of a flat sandy beach with occasional patches of coral.

Ports, Landings and Anchorages

There are no good harbours in the island of Molokai, but along the south coast there are several small bays or landings offering little protection and suitable only for small boats. There are, however, one or two harbours of greater importance.

Kamalo harbour (p. 408), on the south coast, is the only one which is considered safe during *kona* storms. Entrance is through a passage in the reef 150 yd. wide with a depth of 14 ft., and a pier has been built out into deep water. Kaunakakai harbour (p. 408) is suitable only for small craft; it is a pocket in the reef 600 yd. long and 200 yd. wide. A mole extends three-eights of a mile from the shore and is used primarily for shipping pineapples which are loaded into barges or small steamers alongside the mole. Kolo harbour (p. 408) is another pocket in the reef, with a depth of 9 ft. This is a privately developed port for the loading of pineapples.

In the extreme east of the island is Halawa bay, an indentation in the coast about three-quarters of a mile long, but this affords only indifferent anchorage in 5 fathoms and is exposed to the prevailing north-east trade winds.

Social and Economic Conditions

Pineapple growing has been introduced into the island comparatively recently, and mixed farming and market gardening have been undertaken on the homestead lands. But the major portion of the island is devoted to stock raising.

Molokai is the least known and most rarely visited of the larger islands in the Hawaiian group. There are no large towns, but a few small villages are scattered along the south coast, where in former times the native Hawaiian population constructed fishponds inside the reef. There are two isolated villages at the mouths of the Wailau and Pelekunu valleys on the north side of the island. The largest villages are those with landing facilities. Homestead settlements have been established round Kaunakakai and near Hoolehua in the centre of the island. The leper colony is on the north side of the island.

Communications

The Inter-Island Steam Navigation Co. runs a service four times a week between landings in Molokai and Honolulu.

A main road maintained by federal grants crosses the island from Kaunakakai to a point above the cliff overlooking the leper settlement

at Kalaupapa on the Makanalua peninsula. A track leads down the side of the cliff to join a road between Kalaupapa and Kalawao. It is probable that this track has been widened and improved to complete the road. A good road skirts the whole of the south coast and there are numerous local roads in the west of the island. Communication in the mountainous north-eastern area is confined to tracks.

There were, according to published sources in 1930, an airfield near Hoolehua, known as Molokai Airport, and an emergency landing ground on the Makanalua peninsula.

The telephone service joining the principal settlements is linked by wireless telephony with the other islands of the group.

LANAI

Lanai is a small island lying roughly between lat. 20° 44′ and 20° 56′ N, and long. 156° 48′ and 157° 03′ W, separated from the islands of Maui and Molokai by the Auau channel and Kalohi channel, both about 8 miles wide. In shape it is roughly in the form of a D, with the straight side slightly concave. Its greatest length, north-west to south-east, is $17\frac{3}{4}$ miles, its greatest width about 14 miles and its total area 140·8 sq. miles (Fig. 129).

Structure

Lanai is formed of the remains of a single volcanic dome, the summit of which reaches a height of 3,370 ft. Round about the summit is a highland area, roughly 5 miles long and 2 miles wide, eroded in the east into the sharp-sided gulches characteristic of the older dissected cones of the group. On the south-east the area is sharply defined by cliffs formed by faulting, which separate it from a concave plateau which forms the centre of the island.

The plateau area, stretching 5 miles to the north-west of the highlands from their northern end, and about 5 miles to the west from their southern end, is of gently rolling grass-covered downland. A small part of the region is formed into well-defined depressions; these are not craters but are formed by subsidence. Palawai basin, the largest of these, covers an area of about 4 sq. miles with its deepest point about 140 ft. below the general area of the plateau.

Surrounding the plateau is a region formed by lava flows, sloping seawards for a distance of from 1 to 5 miles. The upper portions of this slope consist of sand dunes, frequently assuming a streamlined

shape. Where wind erosion of this form has not taken place the land is considerably dissected by water action. The lower slopes, in places grass-grown, are also strewn with spheroidal blocks of eroded basaltic lava or with spires and monoliths of partly eroded rock left standing where softer material around them has been swept away. Marginal to this 'flow slope' area is an indefinite area stretching on

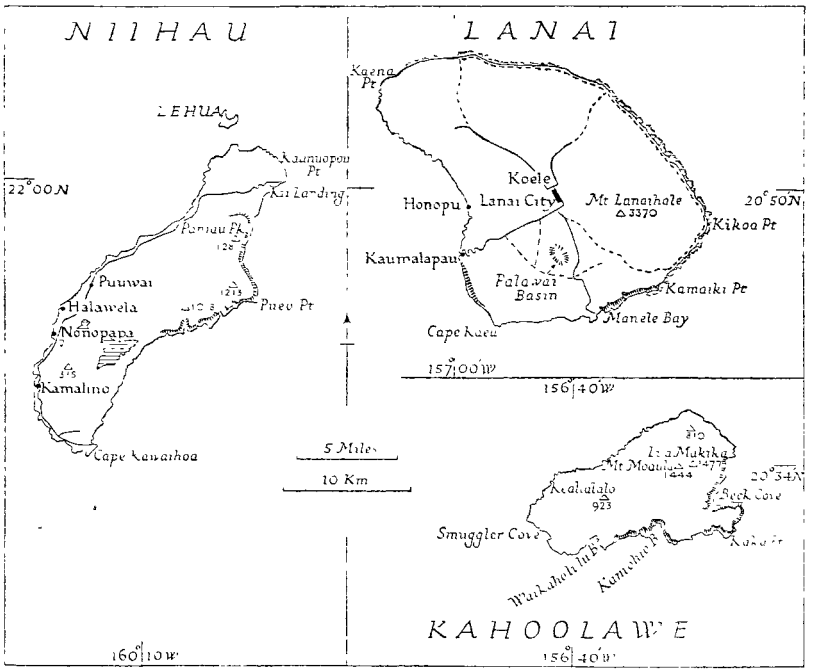


Fig. 129. Minor islands of the windward group

Based on: (1) U.S. Coast and Geodetic Survey charts nos. 4116, 4117; (2) U.S. Geological Survey topographic map of Kahoolawe, 1929.

the west to the cliffs forming the coast, and to the sandy beaches on the east.

There are no perennial streams in Lanai, but after occasional heavy rain the gulches are full of water for a few hours. It has been estimated that by the sinking of wells in suitable places a supply of 500,000 gal. per day could be provided.

Coasts

On the west and south coasts the whole of the shoreline from Kaena point to Pelau point is characterized by steep cliffs. In the south

unbroken cliffs rise to a height of 1,000 ft. above sea level for about 3 miles. The rest of this coast consists of alternating bays and rocky headlands. Off the headlands are remnants of wave-cut beaches varying in height from 5 to 10 ft. In the bays there are frequently short boulder beaches.

On the north-east and east coasts from Kaena point to Kikoa point the coast is fringed by a coral reef extending about 200 yd. offshore. The beach, which is continued round the coast, is sandy with occasional calcareous rocks and boulders. The hinterland is flat alluvial land built up of eroded rock carried down from the mountain by the occasional heavy downpours.

Along the eastern half of the south coast from Kikoa point to Kamaiki point the coral reef continues. The beach is sandy and the hinterland similar to that on the east coast. West of Kamaiki point low bluffs appear, reaching their maximum a little to the east of Manele bay where the beach is sandy. The western portion of the coast between cape Kaea and Kaena point consists of bluffs, which gradually increase in height to Kaena point, near which they are as much as 400 ft. high. Offshore are numerous rocks.

Ports, Anchorages, etc.

The only landings of any importance are Kaumalapau harbour on the west coast, and Manele bay on the south coast. Kaumalapau (p. 410) is a small bight at the mouth of a ravine. A breakwater about 100 yd. long has been built on the north side of the harbour entrance. Inside the harbour there is a small wharf, used primarily for pineapple barges, although small steamers can lie alongside. Manele bay on the south side is an anchorage with a depth of 14 fathoms, suitable for small steamers, but, during the trade winds, squalls alternate from north and south, and the anchorage is unsatisfactory. There is a boat landing in the bay, and a chute for loading livestock to vessels moored close to the rocks.

Social and Economic Conditions

There were formerly about 1,200 Hawaiians on the island, but these had declined to about 130 in 1910. The island was formerly devoted almost entirely to stock raising. But since 1922 the major part has been given over to pineapple cultivation, and the population had risen in 1930 to 2,356. There are five settlements on the island. Koele, in the centre of the island with a population of about 80, is the headquarters of the Lanai ranch. Lanai City, a new plantation

settlement about a mile to the south, is the headquarters of the pineapple industry, and has a population of about 300, mostly workers on the pineapple plantations. Here a power station and refrigerating plant and a pumping station with a capacity of 200,000 gal. a day have been built. These two towns with the two ports and a boat landing at Kaumalapau on the east coast provide the only settlements of any size.

Communications

There is a regular service of pineapple barges and steamers between Kaumalapau and Honolulu.

Roads connect the towns. That between Kaumalapau and Lanai City is macadamized. Another road runs from Koele to Manele bay; it is maintained by the county authorities. A third road runs across the island to the east coast. There are also various tracks, mostly continuations of roads.

An airfield has been constructed in the centre of the island.

There is a radio-telephone system linking Kaumalapau with Honolulu.

KAHOOLAWE

Kahoolawe, which is the smallest of the inhabited islands of the windward group, lies roughly between lat. 20° 30′ and 20° 37′ N and long. 156° 32′ and 156° 42′ W. It has an area of about 44 sq. miles, and is about 10¾ miles in length and 6½ miles in width (Fig. 129). It is separated from Maui to the north by a channel some 8 miles wide.

The highest points of the island, Lua Makika and Moaula, are 1,477 and 1,444 ft. above sea level respectively. The interior has a bare windswept appearance, but is cut by numerous gulches running to the sea on the north side, and by occasional gulches on the south.

The east coast is steep and cliffed, with Kanapau bay occupying the major part. At Beck cove, in the south of the bay, there is a sandy beach which provides a good anchorage in *kona* weather. The south coast is characterized by steep cliffs with two deep indentations, Waikahalulu bay and Kamohio bay. The water in these bays is too deep to provide useful anchorage. The best landing is to the west of the island in Smuggler cove, 1 mile south-eastward of Kealaikahiki point. Off this place there is a good anchorage in 10 fathoms of water. The northern coast consists of rugged bluffs interspersed with gulches. The land rises fairly gently to the highlands.

The soil is a dry red earth which would probably be fertile were the water supply better. Rainfall is negligible because Kahoolawe is

situated under the lee of Maui and shielded from the trade-wind rain. Periods of as much as 18 months may pass without a heavy shower. There are no perennial streams or springs, and wells sunk have not found water. In the interior are a few crater-like depressions in which water collects. Two of these are large enough to retain water for a considerable time after heavy rain. Vegetation is extremely scanty, consisting mostly of grasses, but large areas in the higher parts of the island are entirely denuded of plant life.

A few sheep and cattle find grazing on the island, and the only inhabitants are the herdsmen in charge. In 1930 the census returns showed that there were two men.

MOLOKINI

(Plate 91)

Molokini island, lying in the channel between Maui and Kahoolawe, approximately in lat. 20° 31′ N, long. 156° 30′ W, is the bare remnant of the southern half of an extinct crater. It is crescent-shaped, open to the north, and with a steep crest running along the middle to form a backbone. The easternmost point has been eroded to form a bluff, while at the western end the point slopes down to the sea. The crest slopes steeply on both sides. Landing is difficult. The whole coastline has been eroded to form a wave-cut cliff. There is a lighthouse on the top of the backbone of the island, which is otherwise uninhabited. In general formation the rock bears a remarkable similarity to Kaula islet 19 miles south-west of Niihau (Fig. 132).

OAHU

Oahu lies 22 miles westward of Molokai and about 64 miles east-south-eastward of Kauai roughly between lat. 21° 16′ and 21° 43′ N, and long. 157° 39′ and 158° 17′ W. With the capital, Honolulu, and the United States naval establishments on its south side, it is the most important island in the group.

Structure

Roughly 40 miles long and about 26 miles wide, it is of an irregular trapezoid shape with an indented coastline (Fig. 130). It was originally composed of two adjacent volcanic domes, but large sections of these have disappeared by subsidence or erosion. There remain of the two

original volcanoes the sharply serrated ridge of the Koolau range, the younger of the two mountains, with the Pali, a sheer cliff, forming part of its east side and comparatively gentle but deeply dissected slopes on the west. The older dome to the leeward, Waianae range, with its highest point at Mt Kaako (4,030 ft.), is sharply eroded and dissected towards the sea from which it is separated by a limestone and alluvial plain some 6 miles wide. The straight and nearly parallel valleys of the Koolau range and Waianae mountains are generally

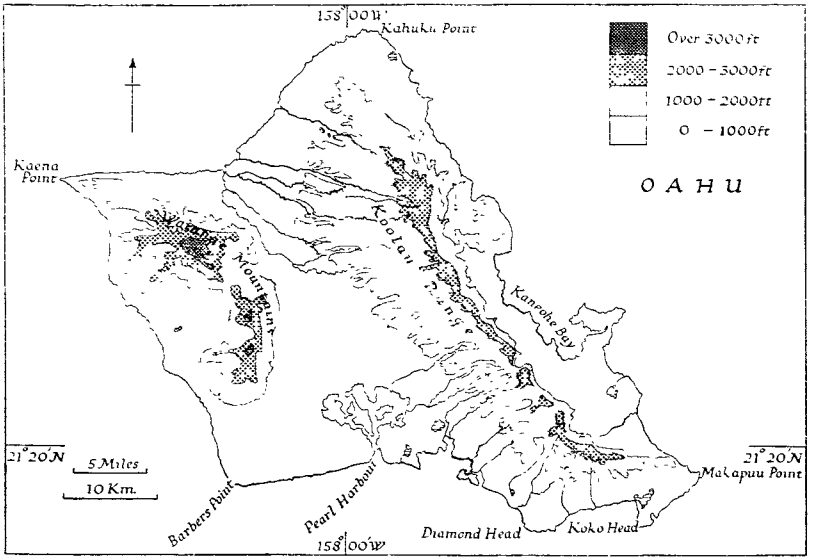


Fig. 130. Oahu: relief

Based on: (1) U.S. Coast and Geodetic Survey chart no. 4116; (2) U.S. Navy aviation chart no. V. 450; (3) U.S. Geological Survey topographic map of Oahu, 1938.

U-shaped or flat-bottomed in section. Between these valleys are long narrow spurs with knife-edge crests, but with a tendency to broad spatulate ends. To the south, from Pearl harbour eastward to Makapuu point, the ends of these spurs are sharply truncated, indicating the presence in former times of a sea cliff. On the windward (north-east) side of the Koolau range, the valleys and spurs are shorter and steeper. North-eastwards from the Pali spurs extend about 3 miles towards the coast.

Between the Koolau range and the Waianae mountains lies a sloping plain mostly of alluvial material which is believed to overlie

flows of lava from the Koolau mountains. Through this a few channels have been cut by the streams which drain south into Pearl harbour.

A coastal plain, largely of raised coral limestone, surrounds the whole island. It varies in width from a few hundred feet to 2 or 3 miles, except where spurs run out to the sea shore forming cliffs, or where headlands are formed by cinder cones.

Coast

The south coast between Barbers point and Makapuu point is fringed for its whole length of roughly 30 miles by a reef which extends about half a mile from the shore. This is broken at the entrance to Pearl harbour and Honolulu. Between Barbers point and Pearl harbour the coastal plain stretches inland for about 3 miles to the foot of the Waianae mountains.

The hinterland between Pearl harbour and Diamond head is occupied by the built-up area of Honolulu and its suburbs including Waikiki beach, known to most people as a seaside pleasure ground where surf-riding is the principal amusement. East of Diamond head the spurs of the Koolau range approach close to the sea. Towards the east the coast is characterized by cliffs which rise sharply by Koko head and Koko crater, a cinder cone, and again at Makapuu point (Plate 85). To the west of Koko head are reef-fringed bays and the sea is shallow for a distance of about three-quarters of a mile from the coast. The coast between the cliffs of Koko head and Makapuu point is characterized by a mixture of sand, limestone boulders, and shingle.

The whole length of the east coast from Makapuu head to Kahuku point is bordered by a fringing reef roughly half a mile offshore. In general the shore consists of sandy beaches interspersed at various points by cliffs, where spurs from the Koolau range project to the sea. The only inlet, Kaneohe bay which recedes about 2 miles, is closed by the reef save for two entrances, and the whole of the bay was till recently filled with detached coral heads. Except for occasional headlands, the plain extends along the east coast as a narrow strip, expanding slightly opposite the Pali (Plate 87). Kahuku point, the northernmost point of the island, is low and covered with sand dunes. There is a small bluff near the point whence the land rises gradually to the mountains.

The whole north-west coast from Kahuku point to Kaena point is bordered by a fringing reef, the shore line consisting of alternating stretches of sandy beach and ledges of stratified limestone rocks.



Plate 87. View from the Nuuanu Pali, Oahu

Looking north, from a height of about 1,200 ft., over to Kaneohe bay.



Plate 88. Pearl and Hermes reef, Hawaiian islands

The photograph, taken from the air, shows the flat character of the island and the general extent of the reef (indicated by the lighter shade of the water). A few buildings may be seen near the centre of the picture.



Plate 89. Nihoa, Hawaiian islands
This view, from the south, shows the approach to the only possible landing.

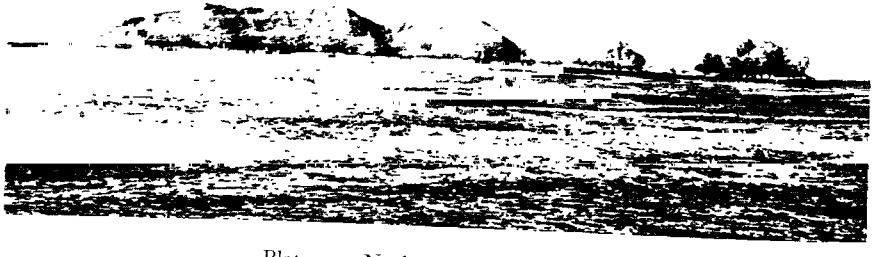


Plate 90. Necker, Hawaiian islands
View from the north. On the central ridge there are traces of former Polynesian habitation.

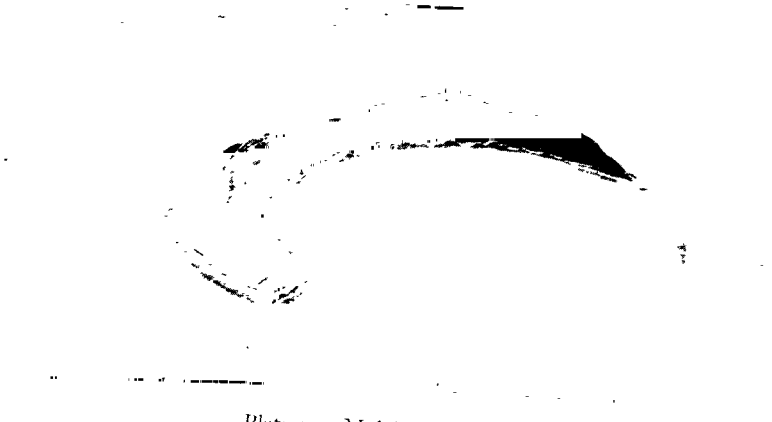


Plate 91. Molokini, Hawaiian islands
This islet, the remnant of a volcanic cone, bears a striking resemblance to Kaula (Fig. 132).

Between the two principal ranges of mountains the coastal plain recedes to form a large re-entrant (the Waialua plain).

Along the south-west coast from Kaena point to Barbers point the reef, exposed at low water, extends at a distance of from 100 to 400 yd. from the shore. The shore, like that of the north coast, is formed of alternating sandy beaches and rocky ledges. At places the mountains rise steeply from the sea (Plate 86).

Ports and Harbours

The only important harbours and ports in Oahu are Pearl harbour and the port of Honolulu.

Pearl harbour, on the south coast of the island, is one of the best and most capacious harbours in the north Pacific islands. It is the principal American naval establishment in the Pacific, and has been equipped on a scale to maintain and repair a large fleet. In general, the harbour consists of an entrance channel dividing into three large lagoons divided by peninsulas, and with a large islet, Ford island, in the middle of the largest lagoon.

At the mouth of the harbour the reef has been blasted away, and the entrance is through a dredged channel 35 ft. deep with a width of about 2,000 yd. save at the reef where the break is only 1,800 yd. wide. The channel is roughly 2 miles long, and the expanse of water inside the harbour is about 5 sq. miles.

Honolulu, about 5 miles west of Pearl harbour, is not only the principal port in the group but the capital of the territory and the principal manufacturing centre and tourist resort (pp. 392–400). Apart from these there are no good anchorages on Oahu. On the east coast Waimanolo bay provides shelter for small craft and an anchorage for small vessels in 10 ft. of water. There is a small wharf there. On the north coast Waimea bay and Waialua offer little shelter, and landing can only be made in calm weather.

Social and Economic Conditions

Sugar and pineapples are the principal products of Oahu. The irrigated plantations, situated on the Ewa plain, are very fertile. Large areas of grazing land are scattered over the coastal plain. Fruit growing and market gardening are important minor industries. Mills, canneries and an iron foundry manufacturing agricultural machinery are all concentrated in Honolulu.

Settlement in Oahu is of three kinds—administrative and commercial, naval and military, and agricultural. Honolulu is a large

commercial town with a population in 1940 of about 181,000, engaged in manufacturing, canning and general trade or administrative pursuits. There are many hotels, and a large part of the population are engaged either directly or indirectly in catering for the tourist trade. The towns round Pearl harbour are partly plantation settlements or else house the dockyard workers stationed at the naval base. In the middle of the island is the large military reserve of Schofield Barracks. The remaining settlements, mostly round the coast, owe their origin to sugar plantations and consist primarily of a mill with the wooden houses of the plantation workers clustered round it, or, in the case of the larger and more modern settlements, a town laid out in rectangular streets. The most important of these settlements are Aiea, Pearl City and Waipahu, near Pearl harbour; Waianae on the west coast; Waialua, which is also a holiday resort, in the north; and Kahuku and Waimanolo in the east.

Communications

The Royal Mail, Canadian Pacific, Matson, American President, Canadian-Australasian and N.Y.K. Lines maintained regular communication with the American coast, Australia and New Zealand, and the Far East. In addition, numerous freighters call and pleasure-cruise steamers used to make Honolulu a regular port of call.

Pan-American Airways maintained a flying boat service across the Pacific, at first using Pearl harbour as a base. There is an airfield outside Honolulu and numerous others are in various parts of the island. Local services to the other islands of the group are run by Inter-Island Airways.

The Federal Highway, the main connexion between the important points in the island, is a wide well-made road. It follows the coast from Honolulu round the east of the island to Waialua in the north, and is joined there by another road of similar quality which runs northwards from Pearl harbour via Wahiawa. A progress map of the Bureau of Public Roads shows two roads running roughly parallel between these points, although an American chart dated 1942 shows only one. Another branch of the Federal Highway skirts Pearl harbour, running to a point north of Barbers point and then north along the coast to Waianae. Beyond there a road maintained by the county authorities continues to Makua. There is said to be a track along which a car can be driven, round Kaena point to Mokuleia. A good road maintained by the county authorities runs north-east from Honolulu across the Nuuanu Pali, which it descends by a series of zigzags, to

join the Federal Highway south of Kaneohe bay. There are, moreover, several feeder roads maintained by the county authorities and private roads of varying quality belonging to the various plantation interests.

The 3 ft. gauge Oahu Railway starting at Honolulu and skirting Pearl harbour follows the south-west, north and north-east coast very closely as far round as Kahana, serving Waianae, Waialua, Kahuku and Laie *en route*. A branch runs north from Waipahu into the interior of the island.

There are numerous W/T stations and a radio-telephone system linking up the island telephone system with the other inhabited islands of the group.

KAUAI

Kauai, the most westerly of the large islands of the windward group, lies approximately between lat. 21° 52′ and 22° 14′ N and long. 159° 18′ and 159° 48′ W, 64 miles west of Oahu. The island is roughly circular in shape with an area of 597 sq. miles (Fig. 131).

Structure

The highest point is Kawaikini peak in the Waialeale mountain range which runs southward to within about 5 miles from the coast. The summit is a boggy plateau stretching in a north-westerly direction for a distance of about 8 miles with a width of about 2½ miles.

The area immediately below the bog is the dissected remnant of the volcanic dome which originally formed the island. Streams fed by the bog have cut their way through the lavas, leaving deep canyons, some as much as 10 miles long with widths up to 2 miles and depths of from 1,000 to 3,000 ft. The sides of these canyons are sometimes vertical cliffs. Subsidiary streams at right angles to the main canyons have cut their way into these, ending in hanging valleys and waterfalls. There are three drainage basins: the first, to the north, occupied principally by the Wainiha, Lumahei and Hanalei rivers; the second, to the east, occupied by the Wailua river and its tributaries; and the third, on the west bounded by the Waimea river, which sweeps southward to flow into the sea near the town of that name.

The northern and eastern sides of the island exposed to the trade winds are naturally more eroded and dissected than the west and south. The dissected highland area is bounded on the east by a series of cliffs in a concave line stretching across the eastern part of the

island. This was caused by former tilting of the island and water action which cut the cliffs back to their present position. A further disturbance raised the level of the island considerably, bringing into existence a raised marine platform of coral limestone formation which occupies the major part of the coast of the eastern half of the island and stretches back from the shore for a distance of from 4 to 8 miles. It is in this area that most of the cultivation of sugar cane is undertaken. Subsidiary tuff cones of a date considerably later than

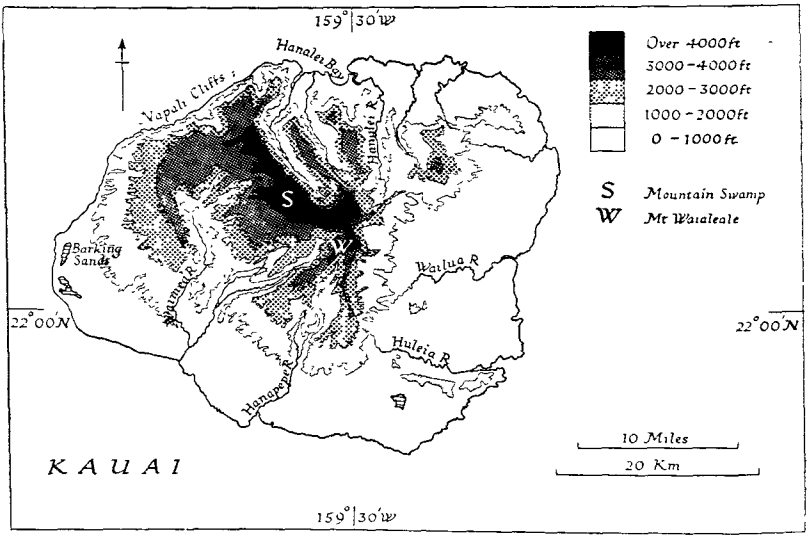


Fig. 131. Kauai: relief

Based on: (1) U.S. Geological Survey topographic map of Kauai, 1912; (2) U.S. Navy aviation chart no. V. 450; (3) U.S. Coast and Geodetic Survey chart no. 4117.

the original dome occur scattered about this area, mostly in the southern part of the plain. The largest cone, Kilohana, is off the south-western corner of the highlands area about 4 miles west of Hanamaulu bay. West of the main dome, which slopes fairly gently to the sea on the west side, is an emerged platform covered with sand dunes rising to a height of about 40 ft.

Coast

The east coast from Makahuena point to Anahola bay consists of low bluffs and cliffs with sandy bays between, backed by a low raised coral plain characterized by lithified sand dunes and occasional

cinder cones. It is broken up by the estuaries of the Huleia, Kapaia, Wailua, Kapaa and Kealia rivers entering the sea at Nawiliwili, Hanamaulu, Wailua, Kapaa and Kealia respectively. Coral reefs occur intermittently along the coast, usually about 600 yd. from the shore.

The north coast from Anahola bay to Makuaiki point, which offers no protection, is full of dangers and may be divided into two sections, eastern and western. The former, fringed by a coral reef, extends as far as Haena and is characterized by numerous low spurs of the central mountain dome which slope down to the sea. There are numerous small bays with occasional sandy beaches. West of Haena for about 8½ miles to Makuaiki point the Napali cliffs rise sheer from the sea to a height of about 2,000 ft. The country inland is wild, barren, uninhabited and inaccessible.

The west coast from Makuaiki point is steep-to for about 3 miles in the north, but is sandy for most of the distance to Mana point. A fringing reef or shoal lies off this coast for the whole of its length, and it is backed by a belt of sand dunes extending roughly 2 miles inland.

The south coast from Mana point to Makahuena point is fringed intermittently by a coral reef. A coastal plain extends behind the shore, narrowing to the east, and is occasionally interrupted by spurs from the central mountain mass and by occasional cinder cones.

Ports, Anchorages and Landings

The best ports in Kauai are at Nawiliwili (p. 405) on the west coast, and Port Allen (p. 404) in Hanapepe bay on the south coast. There are anchorages in the east coast in Hanamaulu bay (p. 410) and Kealia, where there is protection for small vessels. In general, however, there is little protection from the prevailing north-east trade winds. On the north coast there is an indifferent anchorage in Kalihiwai bay with poor holding ground in 5 fathoms, subject to a heavy swell in northerly winds. About 4 miles along the coast is Hanalei bay where there is good protection in easterly winds and landing facilities (p. 410). There is a small bay with a wharf immediately west of Hanalei. This wharf was built for the sole purpose of landing equipment for the hydro-electric power station on the Wainiha river. The west coast is devoid of anchorages, but on the south coast there are anchorages at Waimea for small craft in from 3 to 9 fathoms, and at Wahiawa. The best anchorage and landing on this side of the island is at Port Allen.

Social and Economic Conditions

Kauai was formerly a large rice-producing area, and a little is still grown in the valleys of the large rivers. But to-day sugar plantations occupy most of the available land on the south and east coasts. Pineapples are also grown on a plantation basis and a relatively small quantity of stock is raised.

The rugged mountainous character of the interior and north-west coast of the island, with the difficulties they offer to communication, have restricted settlements in Kauai to a narrow coastal belt running round the coast from Hanalei to Mana. Villages mostly take on the characteristic of the typical plantation settlement with the usual mill or cannery, the houses of the workers and small shops or stores to provide their needs. Lihue, about 2 miles from the port of Nawiliwili, and connected with it by a stretch of Federal Highway, is the most important town in the island. Other important settlements are at Kilauea, Kapaa, Koloa, Hanapepe and Waimea.

Communications

Ocean-going vessels call occasionally at Port Allen and Nawiliwili, and there is a service of the Inter-Island Steam Navigation Co. to Honolulu twice a week.

There are numerous narrow-gauge plantation railways round Lihue and also along the south and west coasts between Koloa and Barking sands.

A Federal Highway follows the coast from Kilauea to Lihue. It then turns westward across the Waianae mountains to Hanapepe, Port Allen and Waimea. A branch runs from Lihue to Nawiliwili and another to Koloa. Roads made by the county authorities continue from Waimea to Mana in the south and from Kilauea to Wainiha. There is thus a good road encircling the island except in the mountainous Napali area. In the more populous east and south coastal areas are a few feeder roads from the outlying plantations. Rough tracks lead into the interior.

According to published sources there are three airfields in Kauai, the Kauai airport north of Lihue, and others at Port Allen and Mana. Inter-Island Airways maintain a service between these points.

The telephone service, which covers the whole island, is linked with other parts of the group by radio telephony.

NIIHAU

The most westerly inhabited island of the windward group is Niihau, lying roughly between lat. 21° 47′ and 22° 01′ N, and long. 160° 03′ and 160° 15′ W, some 17 miles long by 5 miles wide, and separated from Kauai by a channel 17 miles wide (Fig. 129).

Structure

The island may be divided into two regions: a small upland area consisting of the remnants of the volcanic dome, and a low plain never exceeding 100 ft. in height. The former, which is 1,281 ft. above sea level, is deeply dissected and consists largely of lava flows dipping westward. The eastern coast rises sheer out of the sea to a height varying from 600 to 1,000 ft. This is due to the subsidence of a former extension of the island.

On the north-west, west and south sides of the dome is a large area of coastal lowland. This has been formed by the elevation of a broad wave-cut platform. The surface of this plain, which is of a gently rolling character, slopes to the west coast. Certain points rise sharply from the plain. These are either tuff cones or islands of the pre-emergence phase. The highest of these, rising in steep cliffs, is Kawaihoa which forms the southernmost point of the island. Belts of sand dunes, some of which are lithified, rise to an appreciable height on the western portion of the plain.

Coasts

The east coast may be divided into two sections. In the northern half, owing to faulting in the basalt rocks and wave action, the cliffs fall sheer into the sea. The southern half is composed mostly of low bluffs seldom more than 15 ft. high where the waves have cut into the raised platform.

The west coast, sheltered from the prevailing wind, is low and sandy, the southern part forming an almost continuous beach. A fringing coral reef lies off the middle of this coast, and the northern half, which is also low, is obscured by reefs and banks. About half a mile to the north of Niihau is the eroded crescentic remnant of the volcanic cone of Lehua. This islet attains a height of about 700 ft. near the centre, from which point the land slopes gradually to the two horns of the crescent. A lighthouse is situated on the top of the islet.

Landings

Landing can be effected at Kii, a small bight where a jetty has been built of beach boulders, but there is a depth of water of only 2 or 3 ft. alongside. On the western side landing may be made at Nonopapa, or anywhere along the beach of the south-west coast, but from May to September a heavy swell sets in which makes landing dangerous or impossible.

Rainfall

Rainfall is slight (about 35 in. a year), since Niihau is a comparatively low island under the lee of Kauai, where large quantities of rain are precipitated owing to obstruction by the mountains to the prevailing north-east trade winds. There are no permanent streams. For perhaps two days at a time rain water runs down otherwise dry watercourses, but most of the rain is absorbed by the soil. Months or even years may pass without any heavy fall. Water is collected from the scanty rainfall, and a few wells have been bored into the rocks of the lowlands. These soon become saline owing to the porous nature of the rocks.

Vegetation

The soil of Niihau is largely laterite from the decomposed basalt of the highlands. Vegetation is sparse, there are no forests and but few trees. The predominant growth is grass. The *algaroba* bush has been introduced. Its beans are used for cattle food and its wood for fuel. On the sandhills convolvulus and *kolakola* are the principal types.

Social and Economic Conditions

The island is used as a stock ranch, and there is grazing for between 20,000 and 30,000 sheep and 1,000 horses and cattle, but in exceptionally long dry spells it is necessary to reduce the number of sheep. The population is small, consisting of about 130 Hawaiians whose principal settlement is Nonopapa on the west coast. A road has been built along the west coast of Niihau. The inter-island steamship calls occasionally, but the usual method of communication is by Japanese-built fishing sampans to Kauai.

KAULA

Kaula, lying approximately in lat. 21° 40′ N and long. 160° 33′ W, is an isolated remnant of a volcanic cone 19 miles south-west of Niihau. The islet is crescent-shaped with an area of roughly 100 acres and a height of 550 ft. A crest or backbone runs along the whole length of the islet. Steep ash beds which form the sides slope sharply to the sea (Fig. 132).

The islet is almost inaccessible. Steep cliffs, only relieved by the occasional hanging valleys or watercourses, surround the island. At the foot of the cliffs and fringing them for most of their length is a

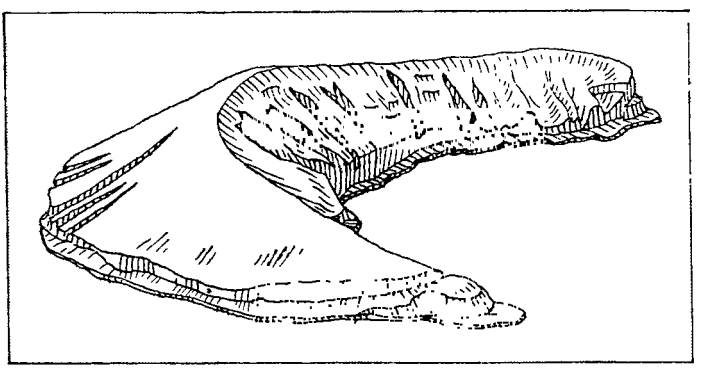


Fig. 132. Kaula

Compare Plate 91 for the similar structure of Molokini. Based on a sketch in H. S. Palmer, *Bernice P. Bishop Museum Bulletin*, no. 35, p. 7 (Honolulu, 1927).

wave-cut terrace which stands some 10 ft. above high water. Landing is very difficult, but a path has been constructed up the convex side of the island to the ridge. Kaula is uninhabited.

LEEWARD ISLANDS AND JOHNSTON ISLAND

The leeward islands of the Hawaiian group form a broken chain stretching west-north-west from Niihau for a distance of 1,200 miles. The easternmost are small volcanic islands diminishing in size as they proceed towards the west, and the more westerly are coral atolls or islands formed on the peaks of submerged volcanoes. Except for Midway island they are uninhabited, but for administrative purposes they are considered to be part of the city and county of Honolulu.

The entirely separate and isolated Johnston island, although about 760 miles to the south of the Hawaiian chain, is considered for convenience here with the Leeward islands.

Nihoa Island

Nihoa (lat. 23° 03′ N, long. 161° 55′ W) lies 120 miles west from Niihau. It is the largest of the leeward islands, with an area of 156 acres and a height on the windward side of 895 ft. Its length is about 1 mile and its breadth about 600 yd. (Fig. 133). It is uninhabited.

The watershed runs very near to the cliffs between Miller peak and Tanager peak on the north side of the island, and slopes at an angle of from 20° to 30° to the south coast. It is cut by six broad shallow valleys which terminate rather abruptly in low cliffs on this side of the island (Plate 89).

Formerly, Nihoa must have been the conical summit of a volcano, the sides of which have been eroded by wave action until only the leeward or south-west quadrant remains. The rocks on the island are olivine basalts, which occur mostly in the form of flows, though some occur as dikes, vertical sheets of intrusive rock cutting through the approximately horizontal beds of lava.

On all sides the coast is characterized by cliffs, rising to a height of about 800 ft. on the north, but much lower on the south. Along this shore are three small coves where the cliffs are low. A wave-cut platform some 10 ft. high runs along the foot of the cliff. In the most westerly cove is a small area of beach sand.

The best landing is made in the middle cove by jumping from a small boat. The best anchorage is in about 15 fathoms off the south-west of the island, but it is exposed in *kona* weather.

There are no regular streams on the island. Water finds its way down the steep valleys into the sea, or sinks into the rock to emerge again at seeps or spring-like trickles.

Vegetation is sparse. Two groups of palm trees exist in East Palm valley and West Palm valley, and a few shrubs and grasses are found.

Necker Island

(Plate 90)

Necker island (lat. 23° 35′ N, long. 164° 42′ W) lies 155 miles westward from Nihoa and is a small rocky uninhabited islet of volcanic origin, roughly L-shaped, with the longer arm lying east and west

about 1,220 yd. long. The shorter arm projects northward from the western end for about 500 yd. A ridge varying in width from 20 to 200 yd. in width and interrupted by five peaks varying in height from 180 to 260 ft. runs along the whole of the longer arm. The total

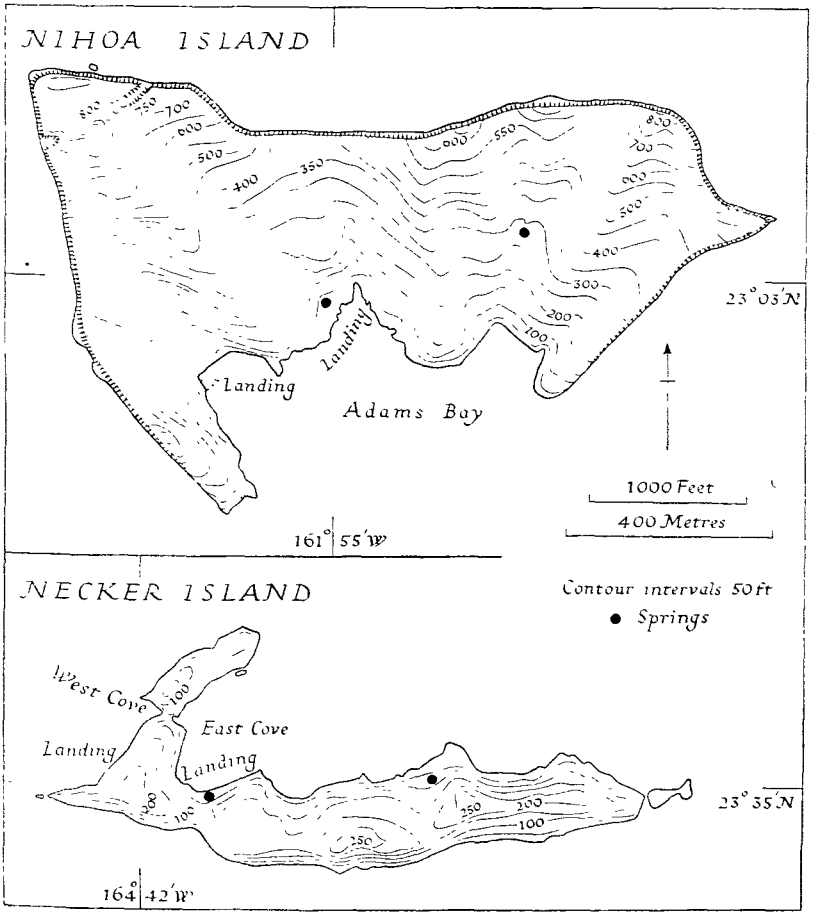


Fig. 133. Nihoa and Necker islands

Based on H. S. Palmer, *Bernice P. Bishop Museum Bulletin*, no. 35, pp. 12, 21 (Honolulu, 1927).

area is about 41 acres. The shorter arm is divided about 200 yd. from the end by a narrow isthmus over which waves break in heavy weather.

Save for this narrow neck of land the whole island is surrounded by steep cliffs, but there is a wave-cut ledge on the western end of

the island. Landing may be made on the ledge in calm weather, or on the isthmus. It frequently happens that when landing and anchoring are impossible on the east of the neck they can be effected on the west and vice versa.

There are no regular streams on the island, but water sinks into the soil and rock to emerge at two seeps on the north side of the long arm of the island. The larger of these gives about 5 gal. per day, and the other rather less. The water is full of acrid salts probably derived from bird droppings.

On the top of the ridge are the traces of stone enclosures made by Polynesian voyagers from Hawaii who visited the rock in search of frigate bird and tropic bird feathers.

French Frigate Shoal

French Frigate shoal (lat. 23° 49′ N, long. 167° 58′ W), discovered by La Pérouse in 1786, is an incomplete atoll of roughly crescentic form. It consists of numerous sandy islets with a total area of about 46 acres, and has no vegetation, or occasionally a little grass. The number, size and position of the smaller of these islets may vary with the weather. Between the two horns of the crescent are La Pérouse rock, an islet of volcanic rock 500 ft. long, rising to a height of 120 ft., and another rock about 100 ft. long and 10 ft. high. Brackish water can be obtained by digging to a depth of about 10 ft. on the larger islets.

The islands are uninhabited but have been visited from time to time by Japanese schooners in search of seal, sharks and turtles. In 1859 Captain Brooks of the *Gambia* left twenty men here during the summer months while he continued his search for guano. They subsisted on fish, eggs, turtle, etc.

Gardner Island

About 120 miles west-north-west of French Frigate shoal, lies Gardner island (lat. 25° 00′ N, long. 167° 59′ W), the most westerly of the volcanic islands in the Hawaiian chain. It consists of two uninhabited islets. The larger, known officially as Gardner pinnacle, rises to a height of 170 ft. and consists of a large conical northern hill separated by a col from two smaller hills in the south. The smaller islet is roughly conical. Both islets have the appearance of being terraced (Fig. 134).

The predominant rock is a dark fine-grained basalt. Most of the rocks originated as lava flows which run roughly north-south. Several dikes or veins of rock strike across this. Specimens of a colourless phosphatic material have been found forming vein-like fillings to cracks in the rock.

It has been suggested that the curving outline may indicate the remains of a crater. The rock is covered with bird guano, giving it the appearance of being snow covered.

The basalt rocks slope steeply into the sea, but in places a wave-cut bench occurs. Landing is exceptionally difficult and on the smaller island has to be made by swimming. On the larger island landing can be made by jumping from a surf boat.

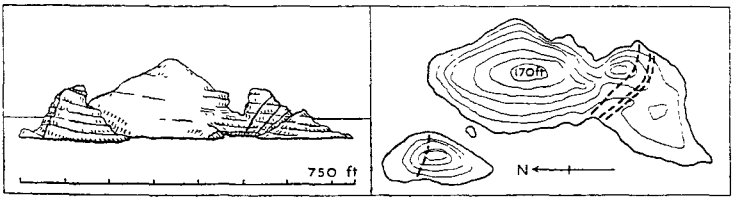


Fig. 134. Gardner island: plan and view from the west

Broken lines on the plan represent dykes of harder rock running through the basalt; these are shown in the view as solid black lines. Based on H. S. Palmer, *Bernice P. Bishop Museum Bulletin*, no. 35, p. 32 (Honolulu, 1927).

Laysan Island

Laysan (lat. 25° 46′ N, long. 171° 44′ W) is a coral island about 2 miles long by 1 mile wide, with an area of slightly under 2 sq. miles. The sandy soil rises from the beach to a height of about 55 ft. and then falls to a central depression filled with a salt-water lagoon. The island is surrounded by a fringing reef lying about 200 yd. from the coast, so small boats can pass between the reef and the shore. A boat passage gives access to the open sea on the west of the island where there is a landing. Vessels can anchor off the island on all sides according to the wind in from 8 to 15 fathoms.

In 1923 there was very little vegetation on the island since rabbits introduced earlier had multiplied and eaten most of it. Seeds of various kinds including casuarina (ironwood) were sown on this occasion, and a few coconuts are growing.

The island is chiefly famous for its bird colony, which is perhaps the largest in the tropics. It was formerly estimated that 10,000,000

birds visited Laysan every year. They include, among others, albatross, frigate birds, petrels, rails, terns, shearwaters, the miller bird and Laysan canary.

Formerly there were quantities of phosphate rock and for a number of years, while this was being exploited, the island was inhabited more or less continuously and tramway tracks were built. Water can be obtained from wells.

Lisianski Island

Lisianski island, which is uninhabited, lies about 145 miles west of Laysan (in lat. 26° 04′ N, long. 173° 58′ W). It was discovered by Captain Lisianski (Lisyanski) in the Russian ship *Neva* in 1805. It is sandy, about a mile long and half a mile wide, and rises on its eastern or windward side to a height of about 40 ft. The island is encircled by a reef with passages into the lagoon which is full of detached coral heads.

Vegetation is scanty, consisting of isolated patches of grass and scrub. It was formerly far more plentiful, but the depredations of rabbits are responsible for the present state of plant life.

Rabbits and birds are abundant and turtle and seals visit the island. Water, which is barely potable, may be obtained by digging down a few feet in the sand. There are small deposits of phosphate in the south of the island.

Pearl and Hermes Reef

Pearl and Hermes reef (lat. 27° 48′ N, long. 175° 51′ W) is an atoll enclosing a lagoon 17 miles long and 10 miles wide with twelve low sandy islets, the largest of which is half a mile long by a quarter of a mile wide. A boat channel from 1 to 6 ft. deep provides access to the lagoon on the north-west side, and there is an anchorage outside the reef on the north-western side of the atoll (Plate 88).

Vegetation is scanty, consisting mostly of isolated patches of grass, but casuarina trees have been planted and are growing successfully.

Turtle, fish and seal are abundant, and in 1928 pearl oysters were discovered in the lagoon. These were at first exploited by individual fishermen and later by a Hawaiian fisheries company, which introduced Filipino divers and erected buildings. The American government sent a small expedition to investigate the oyster beds, and this expedition submitted a report in favour of their drastic preservation.

Midway Islands

Midway islands (lat. 28° 12′ N, long. 177° 25′ W) are about 1,500 miles west-north-west of the island of Hawaii. They form an atoll consisting of two small islands surrounded by a coral reef more or less circular in shape enclosing a lagoon about 5 miles in diameter. The reef rises above sea level to a height of 3 or 4 ft., except for a distance of about 2 miles in the west, where it is submerged. It was selected as a station for the Pan-American Airways service across the Pacific and was later adapted as a seaplane and submarine base.

There are two passages into the lagoon, one in the west and another in the south between the two islands, Sand island (in the west) and Eastern island (Fig. 135).

Sand island has a length of about 2 miles, a maximum width of three-quarters of a mile and an area of about 1·4 sq. miles. Sand dunes rise in the middle to about 40 ft. Eastern island is so low that it is liable to be swept by the sea in heavy weather and is consequently uninhabited.

Anchorage and Landing

Before recent improvements the inside of the lagoon was mostly shallow with a small area of deep water inside the western entrance to the lagoon known as Welles harbour, and a deep central area known as the Inner harbour, varying in depth from 8 to 10 fathoms, and separated from Welles harbour by a bar about 1 mile wide. The rest of the lagoon was shallow and set with coral heads. Through the south side of the reef between Sand island and Eastern island there was a tortuous channel 12 ft. wide leading to the Inner harbour. The outer side of the reef is steep-to, and is inadvisable as an anchorage, although certain small vessels have anchored by approaching close to the west side of the reef. They had, however, to keep a constant watch for any change of wind.

Vegetation and Fauna. There is very little vegetation. The sand dunes are to some extent protected from the wind by an evergreen shrub growing to a height of 8 ft., and known locally as magnolia, and by grasses. The only domestic animals at Midway are the offspring of a pair of donkeys on Eastern island. They were removed from Sand island because they proved troublesome to the inhabitants. They graze on the scanty grasses and obtain brackish water by digging holes in the sand with their forefeet. Large numbers of migratory

birds visit the islands. Since the islands are a bird reserve and they are not molested, they are very tame.

Climate and Water Supply. Climate is generally mild, but nights are apt to be cool in the early months of the year. The average

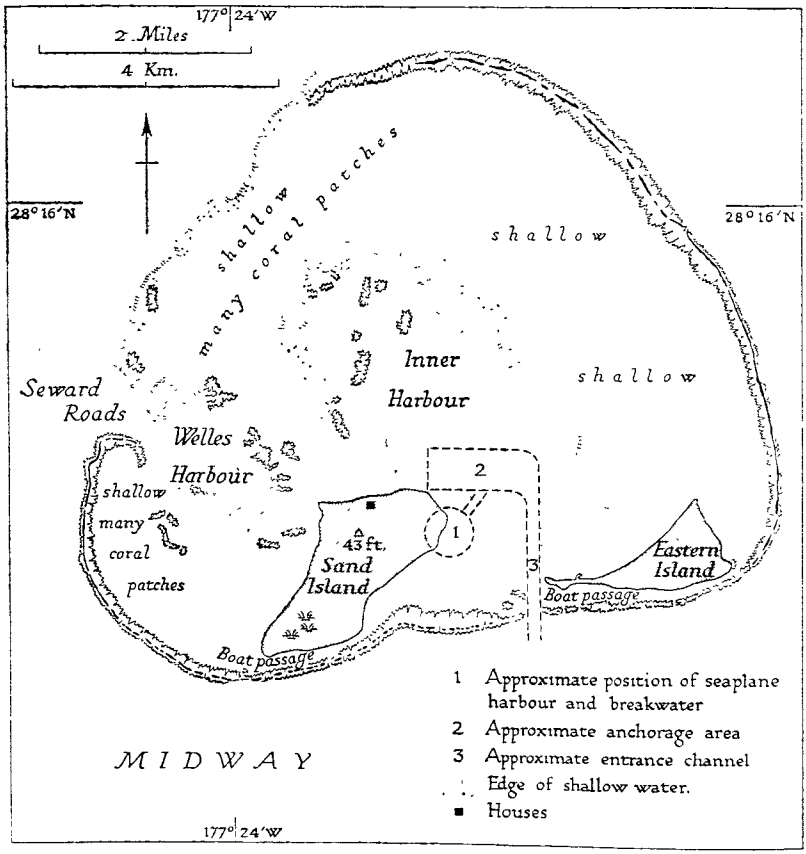


Fig. 135. Midway

Dotted lines represent approximate areas of some recent harbour works, 1939–41. Based on: Warren T. Hannum, 'Construction in the islands of the Pacific', *The Military Engineer*, vol. XXXIV, pp. 63–8 (Washington, 1942).

temperature for August (the hottest month) is 78° F. During summer light north-easterly breezes prevail, but freshen into steady trade winds in July. From October to April, gales occur on the average two to three days a month, working round from south-east to north-west. Rainfall averages from 40 to 50 in. a year. Heavy precipitation

accompanies these storms, and as much as 12 in. have been known to fall in a night. Light rain or drizzle is almost unknown. Water from shallow pools and wells is brackish, but drinking water is obtained by catchment on roofs of buildings and stored in cisterns for future use.

History. The history of Midway islands is brief. Discovered in 1859, the atoll was annexed to the United States in 1867. In 1901 the atoll was visited by poachers who killed large numbers of birds for their plumage. As a result of this episode, agitation for the protection of the birds was begun in the United States. In 1902 an attempt was made to use Midway islands as a coaling station, but this was abortive. A cable station in the link between Honolulu and Wake was built in 1903, and in 1935 Pan-American Airways established a station on their route across the Pacific.

Recent Improvements. An Act of Congress in 1937 authorized harbour improvements at Wake and Midway islands and work was commenced on Midway in 1938. The original plans provided for a seaplane basin protected by a breakwater on the north-east side of Sand island and a channel with a depth of 20 ft. leading from the open sea south of the reef direct to Welles harbour. Subsequently, it was decided to deepen and widen the channel, and to dredge a slip for large vessels to lie alongside a pier to be constructed near the seaplane basin. This work was completed in 1940.

Kure (Ocean) Island

Kure (lat. 28′ 25° N, long. 178′ 25° W approx.) lies 56 miles in a westerly direction from Midway. It is an atoll of roughly oval shape, 15 miles in circumference, with a shallow opening in the reef on the south side of the lagoon. There are altogether three islets in the lagoon. The largest of these, known as Green island, is three-quarters of a mile long by half a mile wide with a maximum elevation of 25 ft. Sand dunes rise rather steeply from the shore. The whole islet is covered with a dense growth of *Scaevola frutescens.* The other islets are small, not more than 10 ft. high, and are practically devoid of vegetation.

Johnston Island

Johnston island (lat. 16° 45′ N, long. 169° 32′ W) and Sand island are low sandy islets on a reef, forming an atoll lying about 760 miles in a west-south-westerly direction from Honolulu. The atoll is a United

States possession administered by the navy and has recently been developed as a naval seaplane station. Apart from service personnel it is uninhabited. Johnston island, the larger of the two islets, is 1,000 yd. long and 200 yd. wide. Sand island, about 7,000 yd. to the north-east, is about 600 yd. long.

Physical Geography

Johnston island is built up of sand and coral rock and several layers of bird bones to a maximum height of 44 ft. Sand island is only 8 ft. high. The reef on which both islands stand extends north-eastward for a distance of about 5 miles. The water over the north part of the reef is only 2 ft. deep. On the south the reef is not continuous and there is deep water in places.

Before the recent developments landing was difficult owing to the sharp coral bottom. At low tide boats could not get nearer than 50 yd. from the shore, but at high water they could land on the sandy beach. The mean tide range is a little less than 2 ft.

There was some protection from north-east trade winds a mile to the south-south-east of the eastern end of Johnston island. The depth of water varied from 5 to 12 fathoms with occasional patches of 4 fathoms. Only three types of low herbs have been found: *Lepturus* bunch-grass, *Tribulus*, and *Boerhaavia*. There are no mammals on the island, but sea birds are very plentiful, as also are lizards and hermit crabs.

History. The island is credited to the discovery of Captain Johnston in H.M.S. *Cornwallis* in 1807, but was not visited again until 1858, when an American vessel took possession of it in the name of the United States. But shortly after a Hawaiian schooner removed the American flag and claimed the territory as Hawaiian. The American ship, however, returned a month later leaving two men behind to gather phosphate. The disputed ownership of Johnston island was finally settled when the United States annexed the Republic of Hawaii in 1898. In the interval between the two dates vessels occasionally called to collect phosphate, and in 1892 H.M.S. *Champion* surveyed the atoll and investigated the possibility of establishing a cable station there.

A scientific expedition from Hawaii was sent to Johnston island in 1923. Following the recommendations of this expedition the atoll was placed under the administration of the Department of Agriculture as a bird reservation. In view, however, of the importance

of the island to any air operations in the Pacific, administrative authority was transferred to the Navy Department in 1934.

Recent Developments. Considerable constructional developments have recently taken place. To provide access to the lagoon for small vessels, a channel has been cut through the reef and extensive building has been undertaken to equip the atoll as a sea-plane station. For this purpose it is eminently suited by its position—between Honolulu and the islands of the central Pacific.

BIBLIOGRAPHICAL NOTE

The most convenient source for material covering individual islands in the Hawaiian group is to be found in the *Bernice Pauahi Bishop Museum Bulletins* published in Honolulu. The most useful *Bulletins* are listed below with number and date.

C. Skottsberg, *Juan Fernandez and Hawaii*, No. 16 (1924); J. B. Stone, *Products and Structure of Kilauea*, No. 133 (1936); C. K. Wentworth, *The Pyroclastic Geology of Oahu*, No. 30 (1926); J. Gilbert McAllister, *Archaeology of Oahu*, No. 104 (1924); James B. Pollock, *Fringing and Fossil Coral Reefs of Oahu*, No. 58 (1928); Kenneth P. Emory, *The Island of Lanai*, No. 12 (1924); C. K. Wentworth, *Geology of Lanai*, No. 24 (1925); J. Gilbert McAllister, *Archaeology of Kahoolawe*, No. 115 (1933); N. E. A. Hinds, *The Geology of Kauai and Niihau*, No. 71 (1931); Wendell Clark Bennet, *Archaeology of Kauai*, No. 80 (1931); Erling Christophersen and Edwards L. Caum, *Vascular Plants of the Hawaiian Leeward Islands*, No. 81 (1931); H. S. Palmer, *Geology of Kaula, Nihoa, Necker, Gardner and French Frigates Shoal*, No. 35 (1927); Kenneth P. Emory, *The Archaeology of Nihoa and Necker Islands*, No. 53 (1929); P. S. Galtshoff, *Pearl and Hermes Reef, Hawaii, Hydrographical and Biological Observations*, No. 107 (1935).

A useful general paper on Maui, Molokai and Lanai is N. E. A. Hinds, 'Maui and the Maui Group', *Geographical Society of Philadelphia Bulletin*, vol. XXIII (1925).

Further information will be found in the works listed in the bibliographical note at the end of the previous chapter (p. 411).

Chapter XI

THE CENTRAL EQUATORIAL ISLANDS

Physical Geography: Political and Economic History: Social and Economic Conditions, 1939–40: Communications: The Northern Line Islands: The Southern Line Islands: Baker Island and Howland Island: The Phoenix Group: Bibliographical Note

The 'central equatorial islands', though not a recognized geographical name, is a convenient descriptive term to cover the several groups of small scattered islands lying between the 150th meridian west of Greenwich and the 180th meridian, and for the most part within about 6° on either side of the equator. They comprise the Line islands to the east, and the Phoenix group and Baker and Howland to the west (Fig. 136). Part of the area, to the north and east, corresponds broadly to what is sometimes named on maps the Central Polynesian Sporades but there seems to be no general agreement as to the content of this term* which is in any case misleading, as it suggests, incorrectly, that the islands are occupied by Polynesians. These central equatorial islands share some physical characteristics with the islands of the Northern Cook group, and the Tokelau group, to the south. But whereas these latter all carry native Polynesian populations of long standing, all of the former, in historic times, have lacked permanent settlement until recently, and some are still uninhabited. In this handbook the Northern Cook group and the Tokelau group are treated for convenience in the next chapter.

The central equatorial islands are of little economic importance. In the nineteenth century they had some value as sources of phosphate, but now the principal product of commercial interest is copra

* In *Andrees Allgemeiner Handatlas*, pl. 207 (Bielefeld and Leipzig, 1912) 'Central-polynesische Sporaden' covers the majority of the Line islands but leaves Caroline, Vostok and Flint with the 'Manahiki Gruppe' to the south. In Bartholomew's *Times Atlas*, pl. 102 (Edinburgh, 1920), the name covers not only the same area but includes Baker and Howland, as well as some non-existent islands. Bartholomew's *Oxford Advanced Atlas*, pl. 96 (3rd ed., Edinburgh, 1928), follows the same delimitation, but omits some of the non-existent islands. The *Soviet Atlas*, pp. 81, 82 (Moscow, 1937), makes the Central Polynesian Sporades a synonym for the whole of the Line islands, including Caroline, Vostok and Flint (and excludes Baker and Howland), though in pls. 11, 12, 13 the term refers apparently only to the northern Line islands. In Admiralty charts and in other publications, as in the National Geographic Society's map 'Theater of War in the Pacific Ocean' (Washington, Feb. 1942), the term Central Polynesian Sporades is not used.

from a few of them. They possess no good harbours, and usually have poor anchorages, while landing is often difficult. But their central position in the Pacific has led to their development as a link in communications. Fanning island has been established for a number of years as an important submarine cable station, while others, notably Canton island, have sprung into prominence as airports for the traffic between Hawaii and the south-west Pacific. The international interest created by the possibility of trans-Pacific air routes

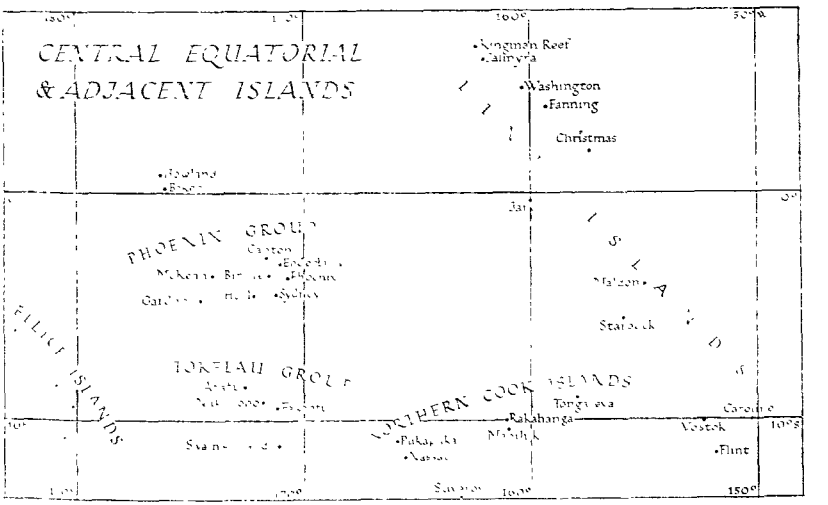


Fig. 136. Central equatorial islands and adjacent groups

All these are low islands or atolls with many physical characters in common. The small scale precludes any indication of the shape of the islands. Based on Admiralty charts nos. 780, 782, 783.

led to the raising of questions of sovereignty and administration which had received almost no attention before, or which had lain dormant for the greater part of a century.

Physical Geography

The islands are all of the same general type, as regards geology, climate, flora and fauna. In size they differ considerably, ranging from Christmas island, the largest, which is about 35 miles long and 24 miles in greatest breadth, to Vostok and Birnie, each less than 1 mile in length and half a mile or so in breadth.

Structure

All the islands are of coral formation and are bordered in each case by fringing reefs. Some, such as Canton, Hull and Gardner in the Phoenix group, or Fanning, Palmyra and Caroline in the Line islands, are typical atolls, with a land rim broken by passages into a lagoon (Plate 92). Others, such as Sydney and Phoenix in the Phoenix group, or Malden in the Line islands, have shallow salty lagoons with no access from the sea. Others still, such as Howland and Baker, or Jarvis, Vostok and Flint in the Line islands, have an unbroken land surface. It seems evident that these latter represent a reduction of original

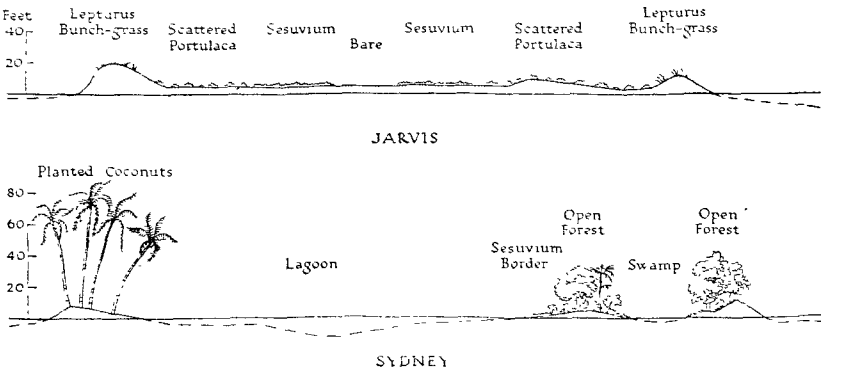


Fig. 137. Profile and vegetation of two types of equatorial islands

Vertical exaggeration nearly 30 times. The sparse vegetation of Jarvis is most typical of the islands in the central dry region; the richer vegetation of Sydney is characteristic of most of the islands of the peripheral region of greater rainfall. The area shown on Jarvis as 'bare' is a site of former phosphate digging. Based on E. H. Bryan Jr., *American Polynesia*, p. 21 (Honolulu, 1941).

lagoons by process of filling with sand and coral, and by evaporation. This view is supported by the fact that every island, with the possible exception of Howland, has a slight central depression in its surface. This process has possibly been assisted by small elevations of the land. On Enderbury island part of this central depression is occupied by a small shallow pond, a few hundred yards across and dotted with sandy islets, while at the eastern end of Starbuck and over much of the surface of Christmas are a number of shallow salt lakes and pools; these are clearly the remnants of former lagoons. Washington, in the northern Line islands, is abnormal, since it has a fresh-water lake in the eastern part and two bogs in the western part. But marine shells and white coral sand on the lake bottom and beneath the layers of

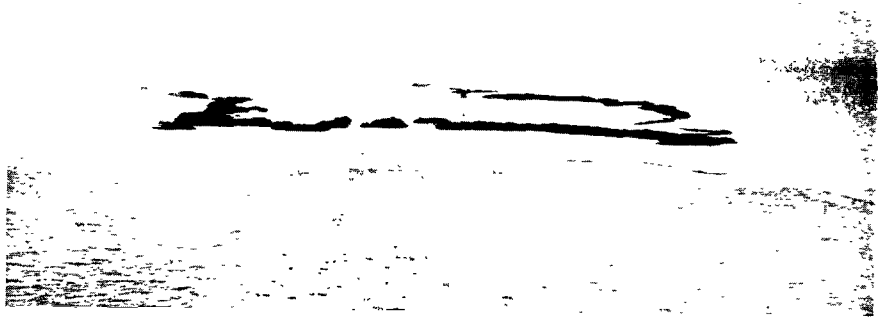


Plate 92. Palmyra, Line islands

Viewed from the east. The general structure of the atoll is shown, with white surf breaking on the outer edge of the reef, the reef area (smooth and light coloured), the dark masses of vegetation-clad islets, and the interior lagoon (indicated by the darker shade of the deep water).



Plate 93. Strawn's islet, north-west end of Palmyra

The vegetation, typical of the wetter equatorial islands, comprises mainly *Pisonia, Tournefortia,* pandanus and coconut.



Plate 94. East coast of Howland

Showing the surf breaking on the fringing reef, the beach of coral pebbles, and the featureless landscape.



Plate 95. Coast of Enderbury, Phoenix islands

The beach is composed of coral sand and pebbles, with irregular slabs of coral sandstone. Photographed in 1939.

peat in the bogs indicate that these all occupy a former lagoon basin. The bogs themselves would appear to be due to the much heavier rainfall than is usual on these islands (with consequently much greater development of plant life) and interrupted drainage to the sea.

All the islands are comparatively low and flat. Christmas island, which has an average elevation of about 10 ft., has a few lines of sand dunes which reach an extreme height of about 40 ft. in places. But Malden, probably the highest island of the rest, has a maximum elevation of only 25–30 ft. above sea level, while nearly all the others are only 20 ft. or less in height. In most cases the highest land is found at the outer edge of the island, which rises fairly abruptly from the shore to a ridge, commonly described as a beach crest, behind which the land gradually slopes down again to the central depression (Figs. 137, 149). Howland island is one of the few which has no pronounced beach crest or central depression, thereby facilitating its possible use as an airfield (Plate 94).

Coasts

From their nature the islands have no prominent coastal features, and many of them, not bearing any tall vegetation, are dangerous to shipping. On Starbuck island, for instance, which is inconspicuous at a distance and has strong currents sweeping past it to the west-south-west, a number of vessels have been cast away; while the bay of Wrecks on the north-east side of Christmas island, with a strong current running into it from the east, and low points on either hand, has merited its name. Major indentations in the coastline are few, and even the atolls with their openings give little shelter for shipping. Only Fanning island and Christmas island have natural ship passes into the lagoon, and that of the latter is suitable only for quite small craft. Fringing reefs round the islands restrict easy access to the shore. In most cases this fringing reef is not much more than about 200 yd. wide, and is often less, though occasionally it is found up to about 1 mile wide, off points of the islands. Usually this reef platform is awash at low water, though those of Jarvis and of Hull dry out, as also do the shoreward parts of the reefs of McKean and of Gardner. There is frequently a heavy sea on the reef, especially on the eastern (weather) side, even in calm weather. At Starbuck it has been noted that the surf has prevented anyone from landing or leaving the island for as much as two weeks at a time, though the ship lay only a few hundred yards away.

There are no cliffs. The slope and height of the beach is apt to vary according to wave action. In protected areas such as inside a lagoon the beach is low and gently sloping, but when exposed to the full force of the waves, as on the weather side of an island, it tends to be high and steep. The beaches are composed as a rule of short stretches of sand, alternating with others of coral boulders, shingle or rubble, or in places of slabs of conglomerate rock (sometimes described as sandstone). Sand is usually more common on the lee side and on lagoon shores; shingle, etc., on the weather side. The sand is exclusively organic, composed of tests (skeletons) of Foraminifera and fragments of shells of molluscs, coral and other marine animals. The rock has been formed by the debris of coral or other marine growths having become cemented together by calcium carbonate (Plate 95).

Anchorages and Landings. Off most of the islands the sea floor falls away steeply from the fringing reef, and anchorage is poor or not obtainable. In the latter half of the last century, when phosphate was being shipped from the islands, mooring buoys were laid down at some of them, as at Malden, Starbuck and Enderbury. A few islands, however, such as Fanning, Christmas, Canton, Sydney and McKean, have moderately good anchorages. Landing at most of the islands is not easy, though it is good at Fanning, Christmas and Canton, where there are piers inside the lagoon entrance. At some islands, such as Jarvis, Washington, Starbuck, Flint, and possibly Phoenix, passages have been blasted in the reef to facilitate approach by boats, but even here it may be difficult to get ashore. Elsewhere it is usually necessary to land on the reef edge and wade.

Climate

Meteorological records for most of these equatorial islands are extremely scanty, or lacking. Where they exist the series of observations are usually short or discontinuous. But sufficient is known to allow of a brief general description of the character of the area, and this may be supplemented by the more detailed information available especially for Fanning, Christmas and Malden.

The area as a whole is dominated by the trade winds. According to the conventional picture of the tropical islands, these winds blow from the north-east in the regions to the north of the equator, and from the south-east in the regions to the south of the equator, with the doldrums, a belt of calms, squalls and variable winds in between. In reality, the situation is more complicated; the trade winds of the

Pacific are not as strong nor as steady as those of the Atlantic, the doldrum belt is narrow, and the trade-wind system has a seasonal oscillatory movement northward and southward. The result is that while the general direction of the winds is from the east, they are apt to vary between north-east and south-east, especially on those islands which are nearest to the equator. At Malden island, in lat. 4° S, the greatest proportion of wind is from the east throughout the year, with a secondary proportion from the north-east in all months except from about June to September, when south-easterly winds assume a secondary prominence. At Fanning island, on the other hand, approximately in lat. 4° N, easterly winds are in the majority from February to May, but otherwise south-easterly winds are more frequent, and north-easterly winds occur with any frequency only in the first few months of the year. In the Phoenix group, and at Baker island and Howland, far to the west and somewhat nearer to the equator, the prevailing winds are easterly, but are most variable between about January and May, at the time when the south-east trades have receded to the southwards. At all the equatorial islands the tendency is for the trade winds to blow steadily, but with no great force; local squalls occur, but severe storms are rare. Squally weather is more liable between November and May, especially south of the equator.

Barometric pressure is somewhat low, the average for the year being 1,009 mb. at Malden island and 1,011 mb. at Fanning island. The mean monthly variation is slight, only about 2 mb., and the daily variation is also small.

Temperature also displays a great degree of uniformity. Such information as exists suggests that mean annual temperatures over the whole area lie between 75° and 85° F., and that the seasonal range of temperature is not great. On most islands temperature seldom appears to rise above 90° F., and then only for a few hours in the day, with cooler nights. Absolute minimum temperatures are rarely more than a few degrees below 70° F. Some indication of the range of temperature is given by comparison of the records, incomplete as they are, from Malden island and Fanning island (Fig. 138), the first incorporating from 2 to 33 years' observations (1890–1926) and the second from 6 to 23 years' observations (1903–28). It will be noted that over the whole of these periods there is a range of less than 35° F. between extremes of temperature recorded at any time, and that there is a variation of only 3° F. or less in the mean maxima or minima for each month in the year.

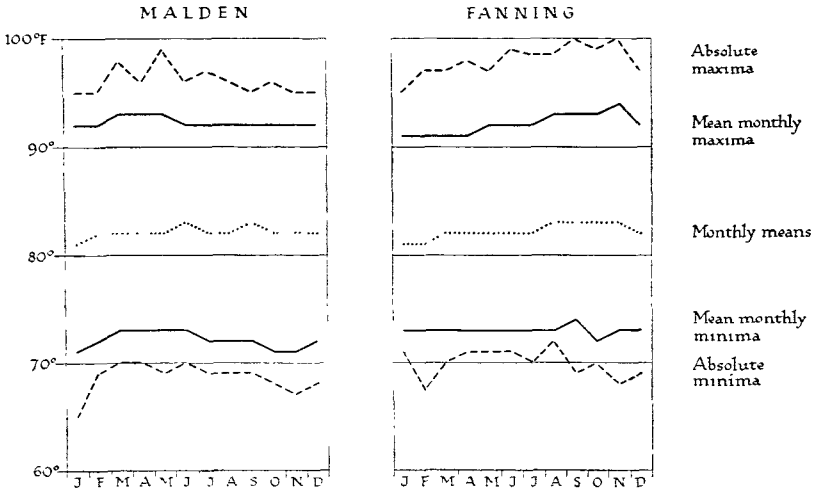


Fig. 138. Comparison of temperatures, Malden and Fanning

Incomplete series of observations, for Malden 1890–1926, and for Fanning 1903–28. Based on *Pacific Islands Pilot*, vol. III, pp. 247–8 (London, 1931).

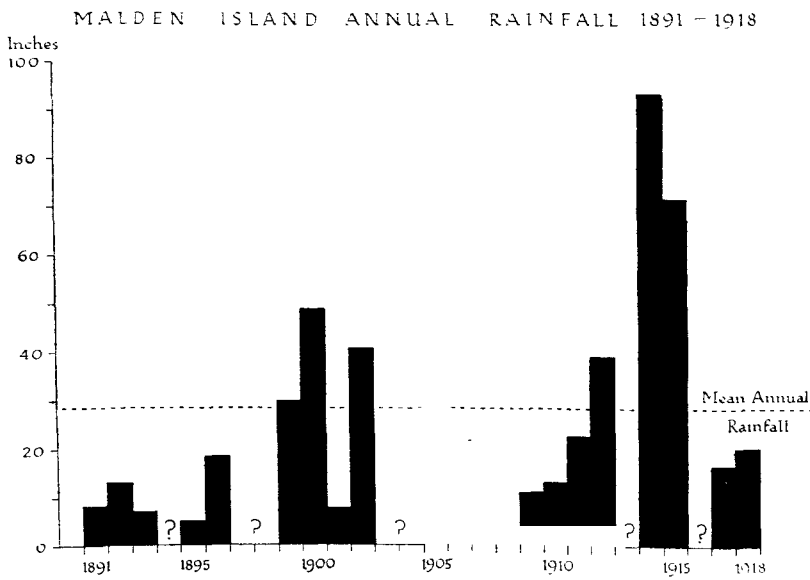


Fig. 139. Annual rainfall, Malden, 1891–1918

Years with incomplete records are indicated by a question mark. The mean annual rainfall for 1890–Feb. 1926 (from incomplete observations) is given in *Pacific Islands Pilot*, vol. III, p. 247 (London, 1931) as 27·4 in. Based on H. H. Clayton, 'World weather records', *Smithsonian Miscellaneous Collections*, vol. LXXIX, pp. 1159–61 (Washington, 1937).

Humidity in the area seems to be only moderately high, but information about it is scanty. Average relative humidity on Malden island has been found to be about 70 %.

Unlike temperature, rainfall is highly variable, not only as between one island and another, but also on the same island from year to year and from month to month. Generally speaking, the islands comprise

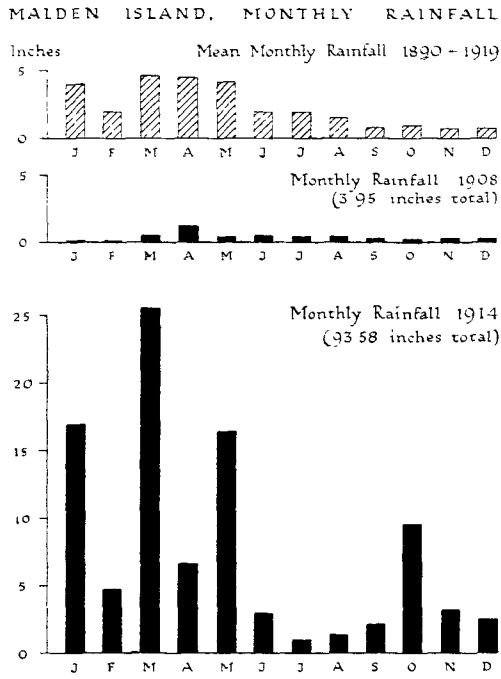


Fig. 140. Monthly rainfall, Malden, 1890–1919

Maximum and minimum years of rainfall in the period have been selected to show variation from the mean. Monthly means for the period 1890–Feb. 1926, given in *Pacific Islands Pilot*, vol. III, p. 247 (London, 1931), approximate closely to the mean values shown here. Based on the same source as Fig. 139.

two distinct regions, a small wet region of Palmyra, Washington and Fanning; and a larger dry region comprising Baker and Howland, the northern Phoenix islands (Canton, Enderbury, McKean, Birnie and Phoenix), and Jarvis, Malden and Starbuck. The former have a rainfall approaching or even at times exceeding 100 in. a year, while the latter have an average annual rainfall which probably does not exceed 25 in. a year. Intermediate between these two types are

Christmas, Caroline, Vostok and Flint, and the southern Phoenix islands (Hull, Gardner and Sydney).

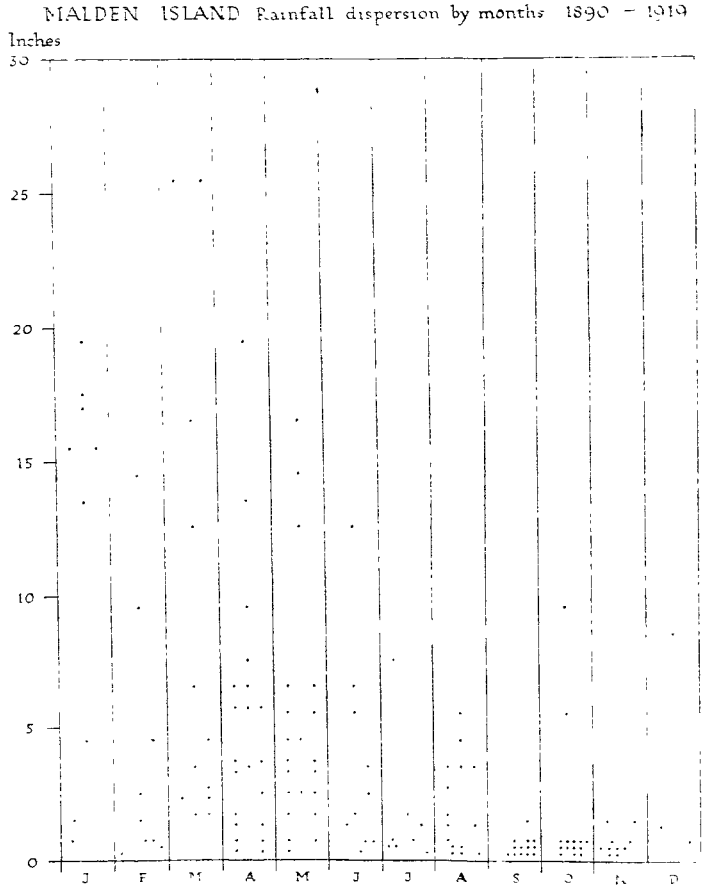


Fig. 141. Rainfall dispersion by months, Malden, 1890–1918

Each dot represents rainfall in one month; owing to gaps in the record the number of dots in each column is not the same. Based on the same source as Fig. 139.

The tendency is for the amount of precipitation to be strongly influenced by the changes in the trade winds. During the middle of the year, when the easterly and south-easterly winds are predominant, rainfall tends to be scanty; towards the end of the year, and in the first few months of the year, when north-easterly winds are more frequent, the rainy season occurs. Any interruption of this periodicity

by westerly winds, however, is almost invariably associated with heavy precipitation. A factor of importance in the case of those islands without lagoons, as Howland and Baker, is the heated air which rises from their sandy or rocky surface. When conditions are favourable for precipitation over the surrounding ocean, the island does not get its share. Heavy rain clouds have often been observed to approach Baker island, for instance, only to be dissipated, with no fall of rain. This effect is most marked on the islands with scanty vegetation, while on those with a dense plant cover radiation is lessened. A cumulative process in differentiating the two types of rainfall region is at work: low rainfall reduces the vegetation and poor vegetation lowers the rainfall still more.

An example of the rainfall which may occur on one of these equatorial islands is given in Figs. 139, 140 and 141. Malden, though in the dry region, probably receives more rain than islands such as Baker or Howland; yet in 6 years out of a total of 21 during the period 1891–1918, the annual rainfall was less than 10 in. In 5 years during the same period, however, it was more than 40 in. Comparison of the mean monthly rainfall for approximately the same period with the monthly rainfall in two sample years, of greatest and least rain, shows how little value may be attached to average figures in this area as a guide to actual rainfall in any year.

Fig. 141 demonstrates how the monthly average is made up of a large number of low values, with a comparatively small number of medium and high values. The general picture thus presented is one of great variation.

Soils

The soils of these equatorial islands for the most part are of a light brown sandy character, but show considerable variation (Fig. 142). Those of Jarvis, Baker and Howland, for instance, depleted by the removal of phosphate, form only a shallow layer on top of the coral conglomerate, which is in places entirely denuded, and in many places on Christmas and on Fanning there is a hard pan of calcium carbonate an inch or more in thickness, either on the surface or a little below. The inland soils of Palmyra and of Washington are darker, moister, and with a high percentage of organic matter due to vegetable mould. In the coconut forests of Washington in particular they are often tough and fibrous, resembling peat, and in the bogs of that island genuine dark brown and black peat prevails, consisting entirely of plant remains in a partly decomposed condition. On the

beach crests of both these islands, however, as elsewhere, the soil is a light greyish brown sand with a low proportion of organic matter.

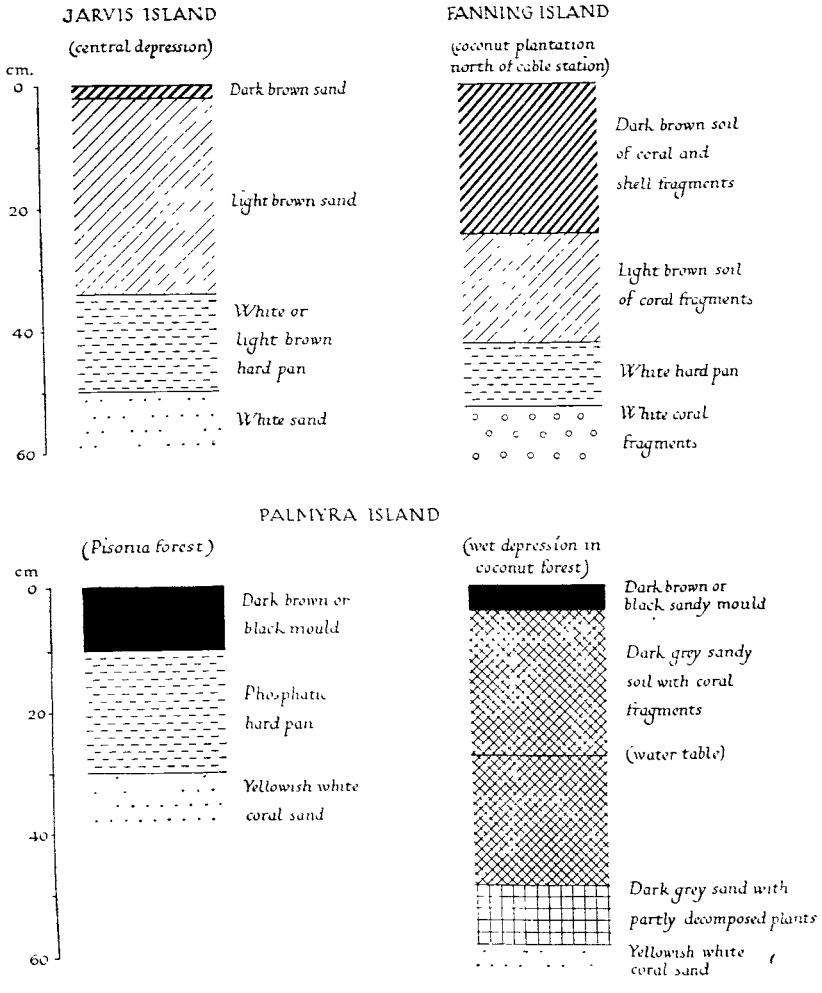


Fig. 142. Soil profiles in three equatorial islands

Based on E. Christophersen, *Bernice P. Bishop Museum Bulletin*, no. 44, pp. 31, 39, 59 (Honolulu, 1927).

Vegetation

The vegetation of the central equatorial islands, owing to the poverty of soil and the low rainfall, is not rich. The indigenous flora



Plate 96. Near the centre of Enderbury

This area, slightly depressed, is occasionally covered with water. The vegetation is *Sesuvium*; the sea birds, which inhabit the island in large numbers, include sooty terns and boobies.



Plate 97. Interior of Baker

This flat surface, with its growth of *Lepturus* bunch-grass and other low plants, is characteristic of most of the island. Photographed before 1937.



Plate 98. Vegetation on Cooper islet, Palmyra

The trees with large rosettes of leaves are *Tournefortia*; *Asplenium nidus* (bird's-nest fern) covers the ground and trees; while *Polypodium phymatodes* is hanging from the ends of branches.



Plate 99. Coral flat on the shore of Cooper islet, Palmyra

Bunch-grass in the foreground, *Tournefortia* (with boobies settled in the branches) in the centre, and the tops of coconut palms behind.

comprises only about sixty species, divided among about forty-five genera, and most of the species are of widespread occurrence. The most marked distinction lies between the vegetation of the comparatively wet region of the northern Line islands, and that of the dry region to the south and west (Fig. 137; Plates 93, 96–99).

The islands in the wet zone have considerable forests: of coconut palms (mostly recently planted, but some of long standing); of *Pisonia grandis*, a tall tree with a massive trunk of soft wood; and of *Tournefortia argentea*, a tree heliotrope with rosettes of leaves covered with silvery hairs. These latter commonly occur as a fringe on the seaward side of the coconut palms. Another tree of the heliotrope family, *Cordia subcordata*, with yellow flowers; a tree of the coffee family, *Morinda citrifolia*; and various species of pandanus also commonly occur. *Scaevola frutescens*, a large coarse shrub with thick glossy leaves and white flowers and fruit, and *Sida fallax*, one of the mallow family with fuzzy leaves and stem and yellow flowers, form extensive thickets in the open, though they are not found as undergrowth among the trees. Two kinds of fern, *Polypodium phymatodes*, with large deeply lobed fronds like giant oak leaves, and *Asplenium nidus*, a large bird's nest fern, also occur in the damp forests, especially on Palmyra (Plate 98), while associated with the bogs of Washington are bulrushes and an edible aroid akin to taro. On the open, unprotected localities of these islands a bunch-grass, *Lepturus repens*, is particularly prominent (Plate 99).

The islands in the region of intermediate rainfall, as Christmas, Sydney, Gardner or Caroline, lack the ferns and bog plants, but have some forest growth, though the trees and shrubs are apt to be lower than in the wet region, and less dense. On the islands of the dry region there are no forests, trees being almost or entirely lacking. The vegetation, nearly always very low, is made up mainly of *Lepturus* bunch-grass on the beach crest; a purslane, *Portulaca lutea*, with robust stems and yellow flowers, and a vine-like herb, *Boerhaavia tetrandra*, in the interior; with a seaside purslane, *Sesuvium portulacastrum*, forming a tangled mat of fleshy stems and leaves along the margins of lagoons and on the flats around them. On some of these islands there are stunted thickets of *Sida* or *Scaevola*, but in general they present a very bare, desolate appearance (Plates 96, 97).

Apart from the indigenous flora, there are a number of types of ornamental and food plants introduced into the area; naturally these occur in greatest number on the islands where there is permanent settlement.

Fauna

Birds comprise the principal land fauna of the central equatorial islands. Land birds in the narrow sense of the term are few, being confined to species of parrakeet, duck and reed warbler in the northern Line islands. The majority of types found in the region as a whole are sea birds, with some migrant waders. Among the commonest sea birds are the boobies or gannets, of three species, one of which, the large masked gannet, nests on the ground, while another, the smaller red-footed booby, nests in trees or bushes if the conditions allow. Common also are various petrels, the frigate bird, the red-tailed tropic bird, and several species of tern, especially the sooty tern and the noddy. The waders include the golden plover, the bristle-thighed curlew, the turnstone and the wandering tattler.

The only land mammals, apart from rats, are a few which have been introduced on the more settled islands, though rabbits which have been liberated on Phoenix island have become fairly numerous. European agency has been responsible for the Norway rats on Baker island, and the smaller Polynesian rats on Howland and on Canton probably arrived in native canoes before Europeans came into the area.

Other forms of land fauna include a few kinds of small lizards, the hermit crab, the robber crab (on Washington island) and turtles which come on shore to lay their eggs. There are few species of insects, mostly associated with plants; mosquitoes, owing to the dry conditions, are found on only a few islands.

Marine life is abundant in the reef waters and in those lagoons connected with the sea by large channels. Spiny lobsters, crabs and shellfish, especially the clam, are plentiful, and many kinds of fish, including sharks, eels, mullet, parrot fishes, sea bass and snapper.

Political and Economic History

The history of the central equatorial islands is largely a record of small-scale economic activities, but it is of interest in view of their present-day political importance.

The pre-European history of the area is practically unknown, but stone ruins on some of the islands, as Fanning, Christmas, Howland, Sydney, Hull and notably Malden, have been shown by archaeological investigation to be temples, house sites and graves of early Polynesians, who either inhabited the islands or used them as stopping places in their Pacific voyages.

European Discovery

The discovery of the islands by Europeans took place comparatively late in Pacific history. Magellan in 1521 crossed the equator in their vicinity, but it is doubtful if he sighted land there; the Spanish galleons sailing annually between Manila and New Spain (Mexico) passed to the north of the area; while Mendaña, Quiros and Roggeveen all kept to the south of it. Nearly all the credit for making the islands

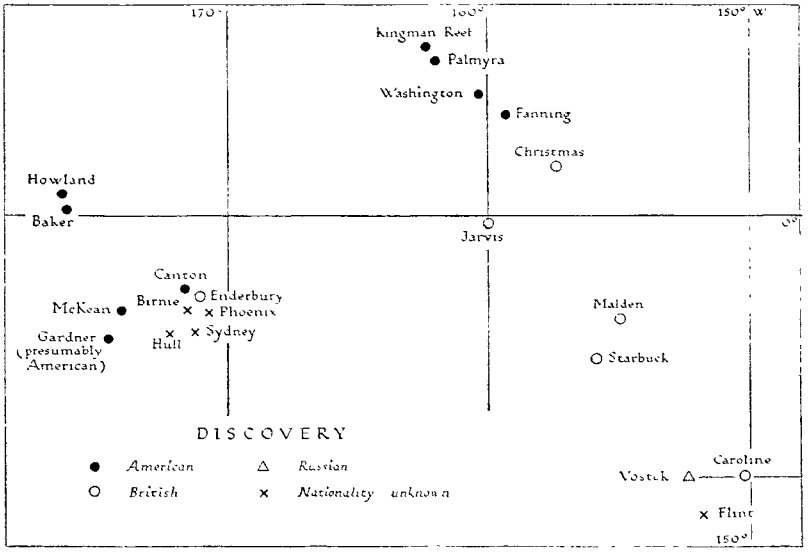


Fig. 143. Discovery of central equatorial islands

Based on data from: (1) E. H. Bryan Jr., *American Polynesia, passim* (Honolulu, 1941); (2) S. W. Boggs, 'American contributions to geographical knowledge of the Central Pacific', *Geographical Review*, vol. XXVIII, pp. 172–92 (New York, 1938); (3) official sources.

known belongs to British and American sailors, towards the end of the eighteenth and in the early part of the nineteenth century (Fig. 143).

First came Captain Cook, who on his third voyage discovered Christmas island in 1777, while just over 20 years later Captain Fanning in the American ship *Betsy* discovered the other northern Line islands. Meanwhile, Broughton had discovered Caroline in 1795. But the other southern Line islands remained unknown for more than 20 years more, till Bellingshausen, leader of a Russian expedition, discovered Vostok in 1820. Starbuck, the American master of a British vessel, discovered the island which bears his name

in 1823, and Captain Lord Byron in H.M.S. *Blonde* discovered Malden in 1825. The discovery of Jarvis is credited to Captain Brown of the British vessel *Eliza Francis* in 1821. But the discoverer of Flint island, apparently sighted about 1801, is unknown. Flint, like several other islands in the area, had its position fixed by the United States Exploring Expedition of 1839–41.

The early part of the nineteenth century, especially between 1820 and 1850, was the most active period of whaling in the central Pacific, and both British and American whalers, but especially the latter, speedily became familiar with the area. The conditions in which they worked, however, with longitude not too exactly determined, log books not too carefully kept, and some advantage in not revealing their movements too closely to their rivals, have often made it difficult to identify the islands they sighted. Moreover, it seems certain that not all their log books, journals and charts have been traced. The history of the islands at this period is therefore not always clear. It is still impossible, for instance, to determine who was the first discoverer of some of the Phoenix group, since these islands were reported at various times under different names, often in positions which do not agree with later more accurate observations. Enderbury was discovered and named by Captain James J. Coffin of Nantucket in 1823, when in command of the British whaling vessel *Transit*; he may have been the Captain Joshua Coffin who is thought to have discovered Gardner in 1828 when master of the *Ganges* of Nantucket. But the first man to sight Phoenix has not been identified, nor has the discoverer of Canton (known also as Mary Balcout, Mary Balcutt's island, Swallow). Baker and Howland were undoubtedly seen before their alleged discovery in 1832 and 1842 respectively. And Hull, sometimes credited to the discovery of Wilkes in 1840, must have been known to Europeans before that, since Wilkes records having found there a Frenchman and some Tahitians who had been left to catch turtles by a vessel which had gone to Samoa to trade. Even when the name of the discoverer of an island is known or surmised it may be impossible to identify him further. The discovery of Sydney and Birnie, for instance, is attributed to Captain Emment in 1823, and he may have sighted McKean also, but neither his vessel nor his nationality are known. His name does not appear in an extensive list of New England whaling masters, and he may well have been master of a British vessel. There is no proof of this, but the names given to the two islands suggest a connexion with Sydney, New South Wales, and with Captain James Birnie, a former whaling master who

had settled there as a merchant and shipowner about 1810. It is possible then that authentic information regarding the discovery of Birnie and Sydney islands will be found in New South Wales rather than in New England.

Exploitation of Phosphate

The whalers made practically no use of the islands, and often did not even land on them. But the dual American and British share in

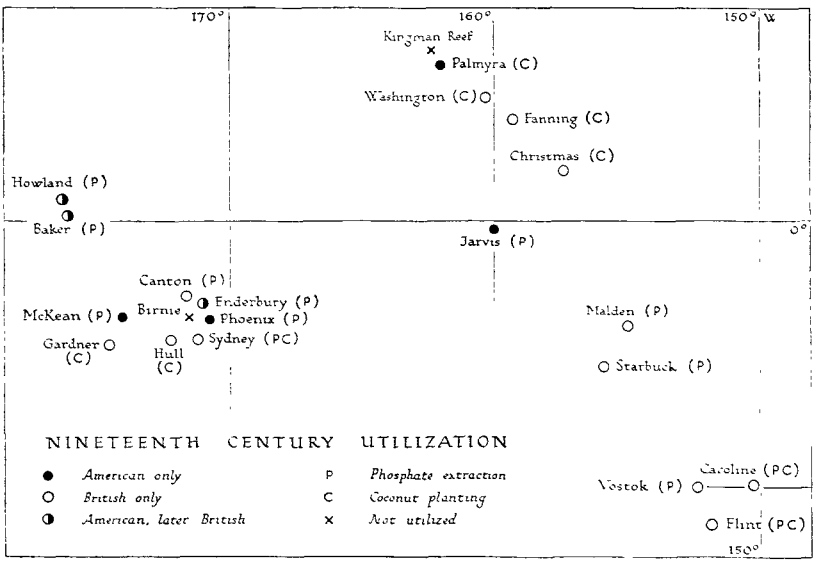


Fig. 144. Utilization of central equatorial islands in the nineteenth century

Based on data from: (1) E. H. Bryan Jr., *American Polynesia, passim* (Honolulu, 1941); (2) S. W. Boggs, 'American contributions to geographical knowledge of the Central Pacific', *Geographical Review*, vol. XXVIII, pp. 172–92 (New York, 1938); (3) A. F. Ellis, *Adventuring in Coral Seas, passim* (Sydney, 2nd ed. 1937); (4) official sources.

the field of discovery had its parallel later in the nineteenth century in the economic field. Here American interest came first, though actual exploitation of resources was limited to only a few of the islands (Fig. 144).

Many of the central equatorial islands had considerable deposits of phosphate, probably the result of the accumulated excrement of sea birds. The greyish powdery material is an excellent fertilizer. In 1855 the first samples were taken from Baker and Jarvis, and sent to the United States for examination. Under the name of 'American

Guano' they attracted the attention of scientists and agriculturalists, and an Act of Congress of 18 August 1856 (commonly known as the Guano Act) provided that when an American citizen discovered this phosphate on an unoccupied island not within the jurisdiction of any other government and took peaceable possession and occupied the island, it might at the discretion of the President be considered as appertaining to the United States. The Act conferred upon the American discoverer, if he complied with certain requirements, including the filing of a bond, the exclusive right of occupying the island for the purpose of extracting guano, and afforded him certain protection. Under this Act claims were made to about forty-eight islands, including nearly all of those in the central equatorial area as well as others outside it. But knowledge of them was often imperfect. Phosphate deposits occurred on only some of those claimed; some had two or more names applied to them and these were thought to be distinct islands; and a number of the 'islands' have now been found not to exist at all.

Exploitation of the phosphate deposits was undertaken by the American Guano Company (by which many of the islands had been bonded) and by its subsidiary the Phoenix Guano Company. The former began work on Jarvis and Baker in 1858, and later extended operations to Howland, while the latter began work on McKean in 1859 and soon turned also to Phoenix and Enderbury. Supplies and labour were taken from Honolulu by schooner, which made the round trip to the six islands about four times a year, and a large number of vessels of various nationalities loaded phosphate from the islands for Honolulu and other ports. Exploitation was intensive for those days, and the enterprise as a whole lasted only about 20 years. McKean was the first to be abandoned as no longer productive, in 1870, and Phoenix was given up in the following year. Work on Enderbury continued until 1876 or 1877; the remaining three islands were finally abandoned in 1879. Though samples had been taken from some of the other central equatorial islands, none of them were worked commercially by the American interests.

Meanwhile British interests had also entered the field. Malden island began to be worked for phosphate by the Melbourne firm of Grice Sumner and Company between 1860 and 1862; this exploitation was continued without a break until 1927. But the major role in exploiting the resources of the area was taken by Mr John T. Arundel, who developed extensive phosphate and coconut-planting interests there on behalf of various British companies, mainly Messrs

Houlder Bros. and a firm which bore his own name. Starbuck was the first island to be worked for phosphate by him, in 1870, and operations were extended shortly afterwards to Flint and Caroline; Vostok was occupied at the same time but no phosphate appears to have been extracted from it. In each case a lease of the island was obtained from the British government. The deposits in these southern Line islands were exhausted by about 1895, but in the meantime Mr Arundel had turned his attention to the Phoenix group. After his visit to Sydney in 1881 operations were begun there in 1883 and extended to Canton in 1885, also on the basis of a guano licence from the British government. About the same time the deposits abandoned on Enderbury by the Americans, as well as those on Baker and Howland, were reworked, since a considerable amount of lower grade phosphate still remained. A labour force of about 100 Polynesians from Niue, Atiu and Mangaia was used. Operations in this area lasted until about 1890, and the parties were supplied by schooner from Apia.

In contrast to the other groups in the area, the northern Line islands were of little interest as a source of phosphate. There was some exploitation of deposits on Fanning between about 1877 and 1887, apparently by Americans; but the deposits on Christmas are small and commercially negligible, while Palmyra and Washington have no phosphate.

By comparison with the modern exploitation of phosphate on islands such as Nauru and Ocean island that from the central equatorial islands was on a small scale. Some islands, such as Caroline and Sydney, yielded only about 10,000 tons or less of phosphate, Flint gave perhaps 30,000 tons in all, and while Malden, Jarvis, Baker and Howland gave many times these amounts, it is possible that on a very rough estimate the total production from all the islands in the area was only in the region of two million tons, or not much more than about twice the annual production from Nauru and Ocean island in recent years. The decline of the industry towards the end of the nineteenth century was due primarily to the exhaustion of the deposits, but competition from richer areas also played a part. Whereas for many years Malden phosphate could be sold without difficulty in Europe at from £4 to £5 per ton, by about 1890 the Continental market began to close, and sales had to be made to the smaller field of New Zealand and Australia, at prices of £2. 10*s.* 0*d.* or less. Export of the Malden product, the only phosphate being extracted from these islands in the present century, virtually ceased after 1914.

But although never on a great scale by modern standards, this phosphate industry has its interest in Pacific history. The observations made on some of the islands at that time are still an important contribution to the geography of the area, and the enterprise as a whole was carried out in conditions of some hardship. Apart from the scarcity of food and water, the loading of the phosphate was difficult. After being run on tram trucks to the beach it was packed into small boats which had to put out through a heavy surf to sailing vessels, moored precariously to buoys, or by lines leading out from the shore on the lee side of the island. Navigation was complicated by swift currents, and many vessels were wrecked.

Coconut Plantations

By contrast with the extraction of phosphate, which could be only a temporary industry, the establishment of coconut plantations in the area represented a permanent source of wealth. Except in the northern Line islands and on Caroline, where natural coconut groves existed at the time of discovery, practically every coconut palm throughout the area has been planted by European, almost exclusively British, enterprise, and even in the northern Line islands extensive planting has taken place.

Caroline was one of the first islands to have an agricultural settlement; in 1846, attracted by the existing coconut grove, the British firm of Collie and Lucett of Tahiti established natives there to rear pigs and poultry and cultivate vegetable foods. About 1848 Fanning was occupied by the same firm for the production of coconut oil; about 1855 it was reoccupied for the same purpose by a British settler with labour from Manihiki. Washington was likewise occupied about 1860. The amount of oil produced was considerable, over 100,000 gal. being exported to Honolulu between 1859 and 1863 from Fanning alone. This industry was later succeeded as elsewhere by the production of copra.

Extensive planting of coconuts was an enterprise which Arundel associated with his phosphate activities, in order that the islands should remain as permanent assets when the phosphate deposits were exhausted. Under his auspices planting was undertaken on Caroline and Flint at various times from about 1875 onwards, and apparently on Christmas in 1880; he also made unsuccessful attempts to establish coconuts on Starbuck in 1870. He was also primarily responsible for plantations in the Phoenix group, on Sydney about 1885 and on Hull in 1887. Planting was also done on Gardner and

on Enderbury about the same time, but on a smaller scale and with less success, and though several thousand coconuts were planted by Arundel's workmen on Howland, all died in a severe drought which affected the whole area from 1890 to 1894.

Later Activities

The subsequent commercial history of the area is concerned primarily with the development of the plantations on the northern Line islands, and on Caroline, Flint, Hull and Sydney. A considerable amount of capital was put into Christmas island in particular. From about 1872 to 1896 a small amount of timber was shipped to San Francisco from Flint, and from 1882 onwards pearl shell was exported from Christmas. In 1902 an important event was the establishment of a cable relay station on Fanning. In 1897 the interests of the firm of John T. Arundel and Company were transferred to the Pacific Islands Company, Ltd., under the chairmanship of Lord Stanmore. Those in the Phoenix group, after passing through further hands, were finally acquired by Burns, Philp (South Sea) Company, Ltd., an Australian firm, while those in the southern Line islands finally passed to a New Zealand firm, Messrs S. R. Maxwell and Company, Ltd. This firm was established as island traders in Tahiti, and had interests in various other French islands, including some in the Tuamotu archipelago. It went into voluntary liquidation in 1934, and its plantations were then carried on by the administrator of the company's affairs. In the northern Line islands, Christmas was acquired in 1914 by the Central Pacific Cocoanut Plantations, Ltd., a company registered in Great Britain but with a French directorate; Fanning and Washington came under the control of a subsidiary of Burns, Philp and Company; while Palmyra passed through a succession of American hands.

A new factor was introduced by the interest of the government of the Gilbert and Ellice islands in native colonization. In 1930, after a visit to the Phoenix group, the administrative officer in charge of the Ellice islands suggested that several islands were suitable for settlement by surplus population from the Gilbert and Ellice islands. Population pressure and land hunger in some of those islands were becoming steadily more acute, and in 1934 the people of Beru petitioned the government to be allowed to colonize the Phoenix islands. Finally, in 1937 an expedition was sent to visit each island in the group and ascertain its possibilities for settlement. As a result the interests of Burns, Philp (South Sea) Company, Ltd.

were transferred by deed of surrender to the government of the Gilbert and Ellice Islands Colony in 1938, the purchase price being £7,500 Australian currency. The Phoenix group as a whole had been incorporated within the colony by a Pacific Order in Council, 18 March 1937, and constituted as a separate district. Settlement of the three southern islands by Gilbert island natives was begun in 1938, and there were in 1940 over 300 permanent colonists on Hull, 260 on Sydney and over 50 on Gardner, with another 250 in process of transfer. Coconuts have been extensively planted, villages constructed with schools, hospital facilities and water supply, and co-operative societies organized. Each adult has been given a grant of coconut palms and each child land for planting. The experiment in colonization has been eminently successful—so much so that two men and a woman even travelled across to Sydney from the Gilbert islands in a small canoe, against wind and current. To enlarge the resources of the community it was proposed at the same time that the adjacent islands of Phoenix, Birnie and McKean should also be planted in coconuts, and work was begun on Birnie in 1939. At a conservative estimate, the whole group of six islands may well support a population of about 2,500 when fully developed.

About the same time as this experiment in colonization was proceeding the situation in the central equatorial islands as a whole was affected by a further element, partly economic in character but also partly strategic. With the development of trans-Pacific air flights came the realization of the possible value of these islands as meteorological stations and air bases. Islands long neglected, such as Jarvis, Howland and Baker, suddenly came to be of equal interest with others such as Christmas and Palmyra, which had been occupied and developed for many years.

The United States government became interested particularly in the islands nearest to Hawaii. Palmyra, included among the Hawaiian islands by Act of Congress in 1898, was surveyed for a naval air base in 1938 and has been declared a U.S. naval defence area, as has also Kingman reef. Jarvis, and Howland and Baker were occupied by a few American colonists in 1935, mostly of Hawaiian or part-Hawaiian blood. Emergency landing fields were constructed on Howland and Jarvis, stone light-towers on Howland and Baker, and a small permanent settlement of wood and stone houses on Jarvis and Baker.

In 1937 a British technical party was landed on Canton, and in 1938 a similar American party set up their camp alongside, while

other Americans were landed on Enderbury. By an Anglo-American Exchange of Notes of 6 April 1939, both islands were placed under joint British and American control for a period of 50 years, and thereafter until modified or terminated by mutual consent. Both nations have equal rights to such air facilities as the islands may afford. During 1938 and 1939 Pan-American Airways laid out and developed an extensive airport on Canton, deepened and cleared a part of the lagoon, and in 1940 initiated a regular air service to New Zealand with Canton as a port of call. For administrative purposes, as far as United States jurisdiction is concerned, Canton and Enderbury are under the Department of the Interior; as far as British jurisdiction is concerned, they are a part of the Gilbert and Ellice Islands Colony, with a resident Administrative Officer on Canton.

Social and Economic Conditions in 1939–40

This brief historical survey shows how by about the end of 1939 the central equatorial islands had begun to emerge from the neglect from which most of them had suffered for many years. All the northern Line islands, three of the southern Line islands, five of the Phoenix group, and Baker and Howland were all occupied. The only uninhabited islands were Malden, Starbuck and Vostok in the southern Line islands and McKean, Birnie and Phoenix in the Phoenix group. The total population was small, probably not more than 1,000, but the range of activities was wide. Washington, Fanning, Caroline and Flint were copra plantations, with the important cable relay station on Fanning in addition; Christmas, where the plantation was temporarily abandoned owing to the low price of copra, was a meteorological station, as also were Jarvis, Howland, Baker and Enderbury; Hull, Sydney and Gardner were flourishing native settlements; Canton was an airport; and Palmyra was a naval defence area. British administrative officials were stationed on Fanning, Christmas, Canton and Hull (Fig. 145).

Living conditions on the recently occupied islands have been radically improved. The tents of the first parties settled on Canton, Enderbury, Howland, Baker and Jarvis have been replaced by substantial buildings of wood and stone, Millersville on Jarvis is equipped with refrigeration plant, and Canton has a Pan-American Airways hotel. The villages on Hull, Sydney and Gardner have been laid out in model style. Of the settlements of long standing, that on Fanning has most amenities, including refrigeration and electric light. Water

is still a difficulty on most of the islands. Cisterns or storage tanks have been set up on most of the occupied islands, but rainfall is so sparse on those nearest the equator that these alone cannot always be relied upon. Water is normally shipped to Howland in drums, and even on Sydney in 1939 drought resulted in the wells being brackish and the large concrete cistern being nearly dry. Canton has an evaporating plant. Attempts to establish coconut palms and other

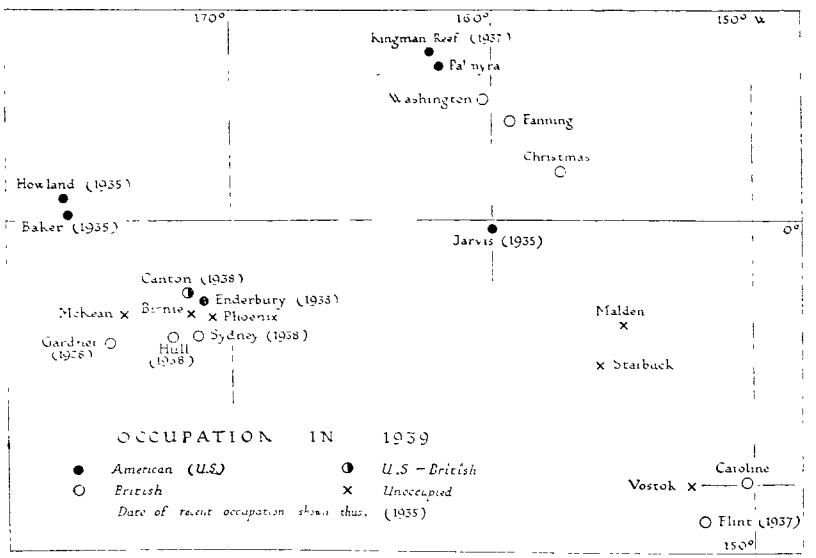


Fig. 145. Occupation of central equatorial islands in 1939

The map shows the situation before the outbreak of war. There were no British subjects on Enderbury, but this island, like Canton, is a part of the Anglo-American Condominium. Based on data from: (1) E. H. Bryan Jr., *American Polynesia, passim* (Honolulu, 1941); (2) official sources.

plants on the more barren islands such as Baker have met with little success for the same reason.

Communications

Until 1940, when Pan-American Airways made Canton a port of call *en route* from Honolulu to New Zealand, the only communication of the central equatorial islands with the outside world was by sea, and that infrequently. Fanning was visited most often, about every three or four months by steamer from Honolulu with supplies, and at longer intervals by the vessel of the cable company. Washington,

Christmas, Sydney and Hull, Caroline and Flint were visited perhaps twice a year by the auxiliary schooners of the respective companies concerned in the plantations. The other islands were without communication. When interest developed once again in the area, visits were made by British and American naval vessels, and since the occupation of some of the islands by Americans, fairly regular communication at quarterly intervals is maintained by U.S. coastguard cutters. Commercial vessels also have called at Canton but at very irregular intervals.

Roads on the islands are almost negligible. Christmas alone has a considerable mileage of road, somewhat rough but passable in all weather for light motor vehicles.

Apart from the cable station on Fanning, signal communications include W/T stations on each of the northern Line islands; on Jarvis in the southern Line islands; on Baker and possibly on Howland; and on Canton, Enderbury, Hull and Sydney in the Phoenix group. There is a post office and a telephone system at Canton.

THE NORTHERN LINE ISLANDS

The Northern Line islands (approximately between lat. 1° 40′ and 6° 25′ N; long. 157° 10′ and 162° 25′ W) comprise Kingman reef, Palmyra, Washington, Fanning and Christmas. The first two are possessions of the United States; the last three form the Fanning Island District of the Gilbert and Ellice Islands Colony, under an Administrative Officer on Fanning, and are the most northerly set of British islands in the eastern Pacific. The value of the group lies in the U.S. naval defence area constituted by Kingman reef and Palmyra, in the cable station on Fanning, and in the possible utility of Christmas as an air base or for the settlement of Gilbert islands natives.

CHRISTMAS ISLAND

(Fig. 146)

Christmas island (with settlement approximately in lat. 1° 58′ N, long. 157° 27′ W) lies about 1,160 miles almost due south of Honolulu. It is not to be confused with the island of the same name near Java.

Physical Geography

Christmas is one of the largest existing islands of purely coral formation. It measures about 35 miles east and west by about 24 miles in greatest width, its total land area being given as about 160 sq. miles, or by another account as about 250 sq. miles. In shape it roughly resembles a large lobster claw, opening to the north-west in a spacious lagoon. The island is low, the general land surface being about 10 ft. above sea level, but on the windward side, to the east, there are discontinuous sand dunes 20 ft. or so high, and rising in places to as much as 40 ft. (or by one account 60 ft.). Evidence of elevation is given by reef rock all along the

shoreline, and by a distinct old beachline to the north of the lagoon entrance, running parallel to an ancient shore platform which forms a ridge about 12 ft. high. The interior is remarkable in being dotted with more than 100 sheets of water, some being lakes several miles in diameter, but most being small pools. These are all brackish or salty. The borders of some are encrusted with salt to a depth of about ½ in., overlying calcareous mud or sand, and the water near the margins is coloured red or orange by algae. Some have no definite source of supply, others are fed by bubbling springs. The water level in adjoining lakes may differ by as much as 10 ft. That these lakes and pools are remnants of an ancient lagoon is indicated

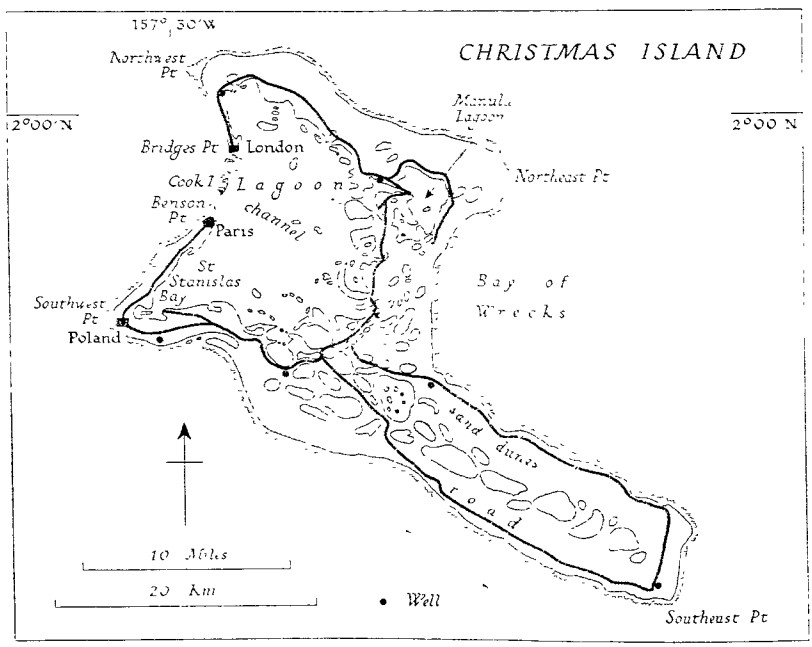


Fig. 146. Christmas

For general key to symbols see p. 8. Based on: (1) U.S.H.O. chart no. 1839; (2) Admiralty chart no. 2867; (3) K. P. Emory, *Bernice P. Bishop Museum Bulletin*, no. 123, p. 18 (Honolulu, 1934).

by fine types of gravel round their margins; some of this is composed almost wholly of high-spired gasteropod shells.

The island is surrounded by a fringing reef, several hundred yards in width. There is good anchorage in 10–15 fathoms outside the lagoon, on the west side, off Cook island. The lagoon itself is well sheltered and spacious, but inside it has many coral patches and in general is too shallow for craft of any size. A shallow entrance with 10 ft. of water over the bar is on the north-west side, and the best landing is round the southern point inside the lagoon, where a small wooden pier extends for about 40 ft. offshore. This is suitable for boats only.

The climate of Christmas island is marked by great similarity of temperature conditions throughout the year. Winds are very constant from the east during the whole of the year, with some variation between north-east and south-east. On the other hand, there is great variability in rainfall from year to year. An estimate of

about 70 in. in wet years and 12 in. in dry years has been given. While the first four months of the year had a total rainfall of 3·8 in. in 1917, and 0·6 in. in 1918, the total for the corresponding period in 1919 was 61·4 in., with a maximum of 4·8 in. in 24 hr. From January to May in this year there were 122 days with rain out of a total of 151 days. The wind during this period was north-east. Barometric pressure is said to be remarkably constant. In ordinary conditions relative humidity on the land drops to a very low figure in the middle of the day, while that on the sea remains fairly uniform. A point of note is that there is usually little surf on the west side of the island. Over a period of three years there was surf on the average on only 35 days in the year, all between November and March, and tending to occur with south-easterly winds.

Water is provided by catchment from roofs into tanks, with capacity of about 4,500 gal., and there are also several wells, dug in 1902, which are drawn upon for washing and cooking. The effect of the dry periods on the water supplies and the vegetation of the island is very marked. In June 1912, there were fresh lakes and ponds all over the island, vegetation was luxuriant, and fresh water could be obtained without difficulty at a foot below the surface. In August 1924, on the other hand, when no rain had fallen for eight months, though the nights had been cool enough for considerable dew, plants were brown and dry, and no water was obtained by digging at the depth of even 3 ft. The inland lakes, however, had not evaporated. The climate of Christmas island may be regarded as semi-arid, intermediate between the arid climate of Baker, Howland and the northern Phoenix islands, and the wet climate of Fanning and Washington.

The soil of the ordinary upland is a light greyish brown, or reddish brown, calcareous sand, deriving its colour from the moderate admixture of organic matter. The surface layer is usually fine-grained, but the lower layer consists mainly of coarse coral fragments, with very little fine sand. In general, the soil has a low water capacity, a condition that is fatal to some of the vegetation during the drought periods. In many places, especially on the south-eastern peninsula, there is a hard pan, composed of calcium carbonate, with an average thickness of about 1 in., in some places covering the surface to the absolute exclusion of all plants. On the sand flats in the north-west part of the island, a part of the formerly extensive lagoon site, a curious polygon structure exists. It much resembles a phenomenon described from arctic regions, but the polygon walls are formed of small dead marine shells, and are not populated by other plants than algae. Since the sand fields are almost level there is no soil flow to account for the polygons, and it is probable that wind is the most important factor in their formation.

The natural vegetation of the island comprises twenty-four species, the most characteristic formation being associations of shrubs and grasses resembling the scrub savannahs of continental areas, and clearly representing a response to the dry climate. *Lepturus* bunch-grass, a grass (*Panicum stenataphroides*), and trailing plants such as *Boerhaavia*, *Portulaca* and *Heliotropium anomalum* are common, as also bushes of *Scaevola frutescens* and *Sida fallax*, growing from about 3 to 6 ft. high. Shrubs of *Tournefortia argentea*, from 12 to 15 ft. high, are also fairly common on the beach crests and dunes bordering the ocean and the lagoon, and also on small sandpits in the lagoon. The coconut palm is prominent north and south of the lagoon, having been planted in quantity from about 1880 onwards, and there are now estimated to be about 200,000 palms in bearing on the island. The taller vegetation is in the western part of the island, the grassland and low shrubs occupy the centre part, and the eastern part is largely bare.

Social and Economic Conditions

Christmas island was discovered by Captain Cook on 24 December 1777, and was annexed to Great Britain in 1888.

The population on 31 December 1938 was 51, nearly all Tahitian labourers and their families. It has varied considerably since then. The two main settlements

are London, north of the entrance to the lagoon, and Paris, to the south of the entrance; there are also camps in various parts of the island, used by the labourers when preparing copra (Plate 103).

From 1882 the island has been regularly worked as a coconut plantation, and well over half a million coconut palms have been planted at various times. After passing through the ownership of several companies the island finally in 1914 became the property of the Central Pacific Cocoanut Plantations, Ltd., with Father Emmanuel Rougier, a French priest from Fiji, as principal director. He lived on the island for many years and did much to develop its resources. An occupation licence was granted to the company by the British government for a term of 87 years from January 1914, for a minimum royalty of £100 per annum. When Christmas was included in 1919 by Order in Council within the boundaries of the Gilbert and Ellice Islands Colony this royalty was henceforth paid to that administration instead of to H.M. Treasury. In 1927 the general taxation due to the Colony in respect of Christmas island was commuted for various payments over periods of years. Though relief was obtained from some of these payments, the low prices of copra ruling during the depression restricted development and it has been estimated that only 15,000 acres has been planted in coconut palms out of a possible 120,000 that could be so utilized. In December 1939 the personnel of the company was withdrawn from the island, but efforts have since been made to keep the plantation going. In 1934 the average annual output of copra from the island was estimated at 500 tons.

Though the primary product is copra, pearl shell was extracted from the lagoon between about 1884 and 1924. At first this was of the black-edged type, but in 1905 the silver-lip pearl shell was introduced from Thursday island by Lever's Pacific Plantations, Ltd.

Christmas is in charge of the Administrative Officer of the Fanning Island District, stationed on Fanning. But communication between the two islands has been very infrequent, and since 1937 an Acting Administrative Officer, who is a Deputy Commissioner for the Western Pacific, has been stationed on Christmas.

Sea communication with the island was maintained until recently by the company's schooner, which called about three times a year. This vessel delivered copra to San Francisco, then returned with stores via Tahiti. Local craft some years ago consisted of one flat-bottomed scow of sheet-iron (capacity 5 tons), two 18 ft. sailing boats and six sailing canoes; there was formerly also a small motor boat.

A road circles the greater part of the island, with a total length of about 60 miles. It is rough but passable in all weathers. There were several motor cars and trucks.

The island has no telephone, but there is a W/T station. In 1937 new powerful equipment (100 W. two-way short-wave unit) was installed, and a government service maintained daily with Fanning and Suva.

Fanning Island

Fanning island (lat. 3° 51′ N, long. 159° 22′ W) is an atoll about 34 miles in circumference, roughly crescent-shaped, and running from north-west to south-east. The land area, variously given, appears to be about 13 sq. miles, and that of the enclosed lagoon about 43 sq. miles (Fig. 147).

Physical Geography

The land rim is about ½ miles wide on the average with a general elevation of less than 10 ft. above sea level at the beach crest, whence the land slopes down to the shore of the lagoon. The highest elevation is about 12 or 13 ft. above sea level. On the ocean side a narrow rocky shelf of coral, at one time a living reef, extends along the west and south shores; it is well exposed in many places at low tide, and is almost completely covered in thin slabs of coral limestone, worn smooth by water action and laid down in shingled layers. The slope from the shelf to deep water is

gradual, making possible a safe anchorage at a considerable distance from the shore. A narrow fringing reef borders the whole island.

Anchorage may be found off the north-west side, in 10–13 fathoms, but Whaler anchorage at the west end offers the best position outside the reef. Here there is the cable company's pier, 129 ft. long, with a 5-ton crane at the outer end (Plate 100). Landing can be made on the beach to the south of this. There are three breaks in the land rim of the atoll, those on the north-west and the south-east (North passage and Rapa passage), usable by canoes in fine weather, and that on the west being a ship entrance about 18 ft. in least depth, with a width of about 100 yd. for navigable purposes. The best anchorage is just within the entrance, at English harbour, where there is an iron pier at which vessels of not more than 18 ft. draught may load, and a mooring buoy, normally for the use of the auxiliary schooner of the

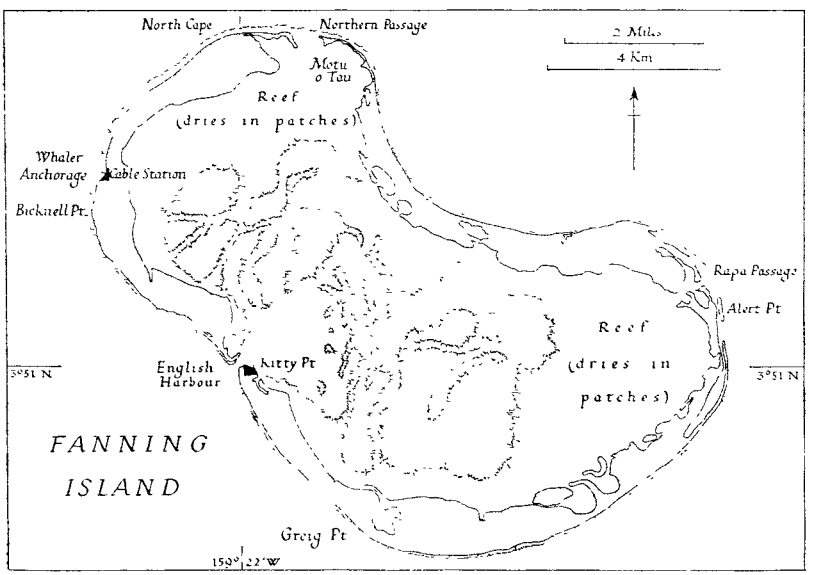


Fig. 147. Fanning

Based on Admiralty chart no. 2971.

Pacific Cable Company. A bar with depths of 12–15 ft. blocks the entrance to a good inner anchorage in the lagoon.

The lagoon itself is very shallow over most of its area, and well filled with coral heads, though in places its depth ranges down to nearly 60 ft. The lagoon shore is in most cases a narrow sand beach (Plate 101).

The climate of Fanning is pleasant and healthy. The most remarkable feature of it is the comparatively uniform temperature (Fig. 138). The average is about 82° F. throughout the year, with mean monthly maxima and minima of 92° F. and 73° F. The 'rainy season', from December to June, has little depressing effect on the temperature.

The force of the wind is likewise uniform. During nine years of observation only two gales were recorded. There seems to be a distinct dry season from August to November, and a wet season during March, April and May. The direction of the wind is closely related to this seasonal change, being mainly south-east during

the dry season and north-east during the wet season. The average number of thunderstorms for the year is 12·7.

The normal precipitation is high, being comparable to that of the lower part of the rain forest in high islands. The average rainfall over the period 1903–28 was approximately 99 in. per annum. The driest month is November, with a precipitation of less than 3 in. rising to about 8 in. in December, and then fairly steadily to a peak of about 14 in. in April, after which it declines fairly regularly again.

There is a fair water supply, from wells and from catchment tanks at both Whaler anchorage, the cable station, and at Baerau, the settlement for copra workers. In 1917 there was a windmill about 50 yd. from the sea near the cable station, pumping potable water day and night from a well about 6 ft. deep. This mill had operated for 20 years; it has now apparently been replaced by an electrically driven pump.

The soil of the coconut plantations is a greyish brown sand, apparently with little organic matter. This sand forms only a shallow surface layer, being replaced a short distance below by a layer of coral fragments, interspersed with fine sand. On the beach crest the sand is lighter in colour, sometimes yellow-white. In the forest areas, however, the soil is dark, with much vegetable mould. Some top soil for growing vegetables and fruits has been introduced in the vicinity of the cable station and the copra settlement.

Porous soil and a low relative humidity prevent the full utilization of the rainfall; but the vegetation is comparable to that of Palmyra, though less luxuriant than that of Washington. The flora consists in all of about forty-five species, including about a score introduced by Europeans and planted near the cable station. These latter include papaya, banana, mango and guava, *Calophyllum inophyllum*, and species of hibiscus. The indigenous or less recently introduced flora includes the *Lepturus* bunch-grass, common in the coconut groves and also scattered along the beach crest, the trailing *Boerhaavia* and *Heliotropium anomalum* on other sandy areas, as behind the beach crest, dense thickets of *Scaevola frutescens* along the shore and in open places inland, and a thicket of *Cordia subcordata* in the north-west part of the island. Large trees also occur, as several groves of *Pisonia grandis* on the northern and eastern parts of the island, with *Tournefortia argentea* on the outskirts, both reaching a height of 35–50 ft.; there is also some pandanus, with very large fruit. The coconut, however, is the dominant tree among the large types, there being about 350,000 palms, most planted, spread over all parts of the island. Coconuts were present on Fanning at the time of the discovery. In the groves a fern and a creeper are to be found, while lichens and mosses are abundant.

Fanning was discovered by Captain Fanning of the ship *Betsy* in 1798. There appeared to be no inhabitants at the time, but enclosures of dressed stone with a technique similar to that of Tonga and a form akin to that of Tongareva indicate the earlier presence of Polynesians. The island was utilized for a time about 1848 by Collie and Lucett of Tahiti, and was reoccupied by Captain English with about 150 Manihiki labourers some time before 1855. Soon afterwards William Greig, a Scotsman, arrived; he married the sister of the leading chief of Manihiki, and some of his descendants still live on the island. Fanning was taken possession of for Great Britain in 1888. It was included in the Gilbert and Ellice Islands Colony by an Order in Council of January 1916.

The population varies according to the copra situation, but at the end of 1938 comprised 195 people, including 28 British and a few Chinese. Most of these latter are employees of the cable company, and the remainder, mainly Gilbertese, are employed in the preparation of copra. The cable station is at Whaler anchorage, on the north-west corner of the island, and the administrative officer lives there (Plate 102). Baerau, the native settlement, is on the south point of the entrance to the lagoon.

Amenities for the European residents include electric lighting and electric refrigeration for bungalows, current being provided by a Diesel-operated plant. There are also medical facilities, a store and a post office which uses New Zealand stamps. The currency is Australian.

The island is worked as a copra plantation by a subsidiary of the Burns, Philp

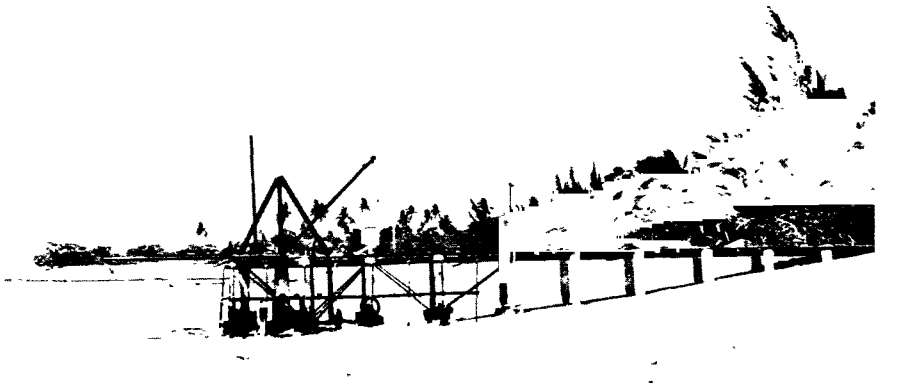


Plate 100. Pier at Fanning, Line islands
The pier is on the ocean beach on the west side of the island, near the cable station.



Plate 101. Part of the lagoon shore, Fanning
Showing pier and small boats used by the cable company in the lagoon.



Plate 102. Building at the cable station, Fanning

With its concrete pile construction, open verandah and overhanging roof the building is of a type adapted to tropical conditions.



Plate 103. Store at the settlement of 'London', Christmas

Buildings at this settlement are of light construction, set among coconut palms. The bare sandy soil is characteristic of much of this island.

Company, who took over the interests of Fanning Island, Ltd., when that company went into liquidation in 1935. Copra production (based on an estimate of 1924) is about 900 tons per annum. The manufacture of coconut oil carried on by English has long been discontinued. A small amount of honey is produced and finds a ready sale in San Francisco.

Communications

Sea communication in normal times is provided by motor vessel from Honolulu, by occasional visits of the cable vessel from Fiji, and by schooners which call irregularly to collect copra. Till 1931 cargo vessels of the Union Steam Ship Company called several times a year with supplies *en route* from Australia and Canada.

Local facilities some years ago included two motor launches, and a number of surf boats, outrigger canoes and flat-bottomed punts for handling copra. No coal is kept in store, but about 8,000 gal. of Diesel oil is available.

There are a few miles of roads, but practically no motor transport.

Fanning is the connecting link of the Pacific cable from Banfield (Vancouver) to Suva (Fiji). A small W/T station transmits up to 300 miles.

Washington Island

(Fig. 148)

Washington island (lat. 4° 43′ N, long. 160° 25′ W) lies about 75 miles north-west of Fanning. It has also been known by the names of New York and Prospect.

Physical Geography

Washington is a low coral island, rather more than 3 miles long and 1 mile wide, with a total area of about 3 sq. miles. This includes a fresh-water lake with an area of about 1 sq. mile, and two peat bogs, each covering an irregular area of about 200–250 acres, and connected by a narrow strip of semi-boggy land. The average height of the island at the beach crest is about 10 ft., but it rises in places to about 16 ft.

The present bog and lake region has undoubtedly once been occupied by a salt-water lagoon, as marine shells are abundant in the coral sand at the bottom of the peat layer. By the gradual emergence of the land this lagoon was cut off from the surrounding ocean, the salt water evaporating or disappearing through seepage. By abundant precipitation the salt deposits were washed out, and the formation of a fresh-water lake made possible.

At present the bog surface lies at a higher level than the surrounding land, with a slightly elevated ridge at the edge (Fig. 149). This ridge may be a sort of natural levee resulting from overflows at a time when the drainage system was still in its natural state. Recently, artificial canals have been dug for the transport of copra, and the water level may be lowered at will through cuts in the beach crest. The water table lies from 8 to 10 in. below the bog surface, but it is apparently subject to fluctuations. In time of drought the bog surface is so dry as to allow one to walk upon it. At present the lake is encroaching upon the land surface between it and the bog by undercutting the trees.

The island is bordered by a fringing reef of varying width, reaching out in parts for 1,000 yd. or so. There is an exposed anchorage on a bank off the west end of the island, in depths of from 9 to 17 fathoms. Landing is difficult, but is best on the south-west side at the new landing place at some distance from the anchorage. Most of the beach is of fine sand.

Few climatic records exist for Washington but temperature and wind conditions are almost the same as at Fanning. Rainfall figures for a long period are not available, but in four months (from May to August 1922) precipitation was nearly 10 in.

with an average of 10 % higher than that of Fanning over the same period. In the year 1928–9 rainfall was 91 in. Coupled with the vegetational and physiographic evidence this suggests that Washington has a definitely wetter climate than that of Fanning.

The soils of Washington have a unique position among those of the equatorial islands in being for the most part a dark brown or black mould with peat in the

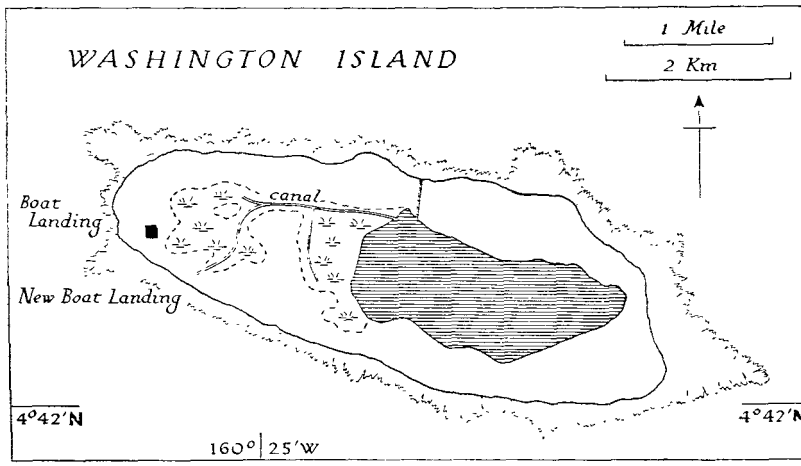


Fig. 148. Washington

Based on: (1) U.S.H.O. chart no. 1839; (2) Admiralty chart no. 2867; (3) E. Christophersen, *Bernice P. Bishop Museum Bulletin*, no. 44, p. 48 (Honolulu, 1927); (4) E. H. Bryan Jr., *American Polynesia*, p. 167 (Honolulu, 1941).

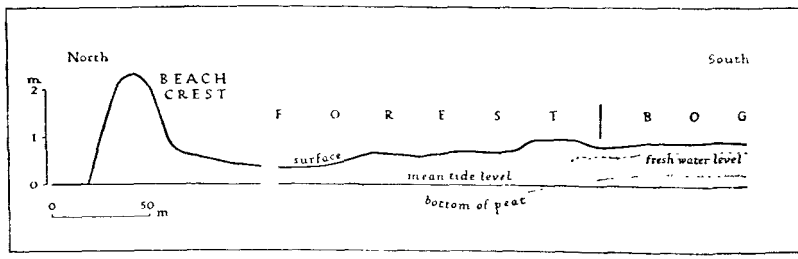


Fig. 149. Washington: section

Vertical exaggeration, 25 times. Based on E. Christophersen, *Bernice P. Bishop Museum Bulletin*, no. 44, p. 51 (Honolulu, 1927).

bogs or as an underlying layer to the mould in the centre of the island. In depth the soil varies greatly, being dependent on the distance from the beach crest, as the coral rock floor slopes down towards the centre of the island, while the forest floor rises. The water content of the mould and of the peat is high. In sharp contrast to these inland soils is the soil of the beach crest, which is of the same type as those of the other equatorial islands, being a light greyish brown sand with a small amount of organic matter.

The vegetation of Washington falls into two parts: that of the central lake and bog region, and that of the peripheral belt completely encircling it. The contrast is very great, the one area being occupied mainly by a sedge meadow, while the other is largely covered by a luxuriant coconut forest. The flora as a whole comprises about thirty-five species, apart from papaya, guava, banana, hibiscus and other introduced species planted at the settlement.

The bog area is occupied primarily by a sedge (*Scirpus riparius*), with a giant edible aroid (*Cytosperma chamissonis*) and a species of pandanus forming a narrow belt at the edge. Behind this again lies the coconut forest in a dense and apparently ancient growth; it occupies about 2,100 acres, of which only 200 acres have been planted. Among the coconut palms are pandanus, *Pisonia* and other trees, with a dense undergrowth of *Polypodium phymatodes* and other ferns. On the beach crest are *Lepturus* bunch-grass and plants of trailing habit, with some *Scaevola* thickets and *Tournefortia* trees from 25 to 35 ft. high.

The fauna of the island is scanty, consisting principally of Alexandrine rats, lizards, land crabs, coconut crabs, sea birds, and a few land birds such as parrakeets. Fish and other marine fauna are abundant.

Social and Economic Conditions

The history of Washington is very similar to that of Fanning. It was discovered by Captain Fanning in 1798 and named after the great American President. It was occupied by Captain English about 1860, and by Greig and Bicknell about 1870. Tahitians, then men from Manihiki and finally Gilbert islanders were employed as labourers. The island was annexed to Great Britain in 1889 and included in the Gilbert and Ellice Islands Colony in 1916. It is administered as part of the Fanning Island District through the Administrative Officer on Fanning.

The population of the island is somewhat variable, since it consists largely of plantation labourers. In 1937 there were 83 inhabitants, including three Europeans, while on 31 December 1938 there were 123, including one European. The village is near the western end of the island. Production is entirely copra, the island being worked by a subsidiary of the Burns, Philp Company in the same manner as Fanning. The labourers are Gilbertese, on a three years' contract.

Communications

External communication is primarily with Fanning, by the occasional visits of the company's auxiliary schooner. Local communication is mainly by motor boat and rowing boat along the canals. There is no information about signal communications other than a mention of two W/T masts at the south-west point.

PALMYRA ISLAND

Palmyra island (lat. 5° 52′ N, long. 162° 06′ W) lies about 120 miles north-west of Washington.

Physical Geography

Palmyra is an atoll in the shape of a horseshoe, consisting of fifty-five small islets surrounded by an extensive reef platform occupying a space of about $5\frac{1}{2}$ by $1\frac{1}{2}$ miles, with the long axis running east and west. The reef platform, of coral and hard sand, is covered at high water, but one can still walk from one islet to another, and at low water parts of it are dry. The reef encloses three distinct lagoons, each having 20 fathoms or more of water, but without entrance even for boats. All the islets are very low, maximum elevation being only 6 ft. above sea level. The total land area is about 250 acres, the area of the largest islet being 46 acres (Plate 92).

The safest approach for anchorage is from the west, as shallow water extends for some distance from the north-western and south-western points. Anchorage may be found in 9 fathoms on a bank off the western side, on sand and coral bottom. Landing may be difficult at low water on account of many coral heads, but improvements have probably been made recently.

The climate of Palmyra has not been studied in detail, but appears to be similar to that of Fanning, with considerable rainfall, though on the whole less than that of Washington. Winds are easterly throughout the year, but rather more northerly inclined about the end of the year. Strong squalls from the east and south-east occur.

The character of the soil varies with the different islets. The beach crest is usually a light greyish brown sand, mixed as a rule with root fibres, but with a low percentage of organic matter and a very high water content. The soil of the interior of the larger islets and of some of the smaller islets is dark brown to black mould, very moist, and with a high proportion of organic matter. In some cases, however, the soil layer is very shallow, with an underlying hard coral pan almost completely transformed into calcium phosphate, and a layer of yellowish white coral sand below.

The vegetation, though not so luxuriant as on Washington, is abundant. About sixteen species of plants have been recorded. Most conspicuous are the vigorous forests of coconut palms, associated with the sandy non-phosphatic soils, but stands of *Pisonia grandis*, associated with the dark mould, are prominent on some of the islets. Trees of *Tournefortia argentea* fringe the shores of most of the islets, pandanus is also common in moderately wet areas, and *Polypodium* and other ferns help to form a dense undergrowth in many places (Plates 93, 98, 99).

Social and Economic Conditions

The island is regarded as having been discovered by Captain Sawle of the American vessel *Palmyra* in 1802. Possession was taken of it for the Hawaiian government in 1862, and it was included among the Hawaiian islands by Act of Congress in 1898; formal possession was reaffirmed by the United States in 1912. Though within the incorporated city limits of Honolulu, it falls under the jurisdiction of the U.S. Navy Department.

Until recently the island was a coconut plantation. Some palms were growing there about the middle of the last century, but more were planted; in 1886 there were 8,000 palms in full bearing and in 1913 there were 25,000. The island, under American ownership in Honolulu, was leased for a time to the Palmyra Development Company. It was considered by Pan-American Airways as a depot or landing place for the Honolulu-New Zealand service, but it was not developed as such. Now Palmyra and the waters within a 3 mile limit constitute a U.S. naval defence area, prohibited to foreign vessels and aeroplanes. Improvements begun in 1939 have probably done much to transform the island into an air base, for which it is eminently suited.

Kingman Reef

Kingman reef (lat. 6° 25′ N, long. 162° 25′ W) lies 33 miles north-west of Palmyra. The reef is of atoll character, of triangular shape with apex to the north, and is about 9½ miles long by 5 miles wide at the base. The reef uncovers at low water at the eastern end and for some distance along the north-east and south-east sides, but the only dry land is a small coral and sand islet near the east end. This varies in size and height as storms pile up or wash away material, but its dimensions have been given recently as about 250 ft. long and 3 ft. high. The lagoon has depths of from 3 to 42 fathoms, with no apparent coral obstructions, and the best entrance channels, with least depth of 10 fathoms, are near the north and the south-west points of the reef. Anchorage is available in the lagoon, with good holding ground.

Outside the encircling ridge with depths of from 4 to 10 fathoms the bank falls suddenly away to depths of 300–400 fathoms, and anchorage is not obtainable.

The reef was discovered by Fanning in 1798 but named after the master of the American vessel *Shooting Star*, who found it again in 1853. Several wrecks have occurred there. A few coconut palms were planted there in 1924 and may still survive.

Kingman reef has some potentialities as a seaplane base. It was so used temporarily during trial flights of Pan-American Airways Clippers in 1937–8 between Honolulu and Pango Pango, but was later discarded in favour of Canton island. Possession was taken of the reef for the United States in 1922, and in 1941 it was declared a U.S. defence area.

THE SOUTHERN LINE ISLANDS

The southern Line islands comprise six small islands lying north of the Society islands and scattered widely between long. 150° and 160° W, and lat. 11° S and the equator. Tongareva, as part of the Northern Cook group, is excluded, though it falls within the area. Victoria island, still shown on some maps, is not mentioned in *Sailing Directions* and may be regarded as non-existent, while Filippo, sometimes also shown, is a reported reef. Malden, Starbuck, Vostok, Caroline and Flint are British possessions, administered through the High Commissioner for the Western Pacific. Jarvis is occupied by Americans. Most of the islands were worked at one time for phosphate, but with the exhaustion of the deposits their only commercial importance at the present time is the copra plantations on Caroline and Flint.

JARVIS ISLAND

(Fig. 153)

Jarvis island (lat. 0° 23′ S, long. 160° 02′ W) is the most northerly of the southern Line islands. It is a small coral island about 1½ miles long by 1 mile wide, and from 12 to 23 ft. high at the beach crest with an inward slope to a central depression less than 5 ft. above sea level. The island shows signs of upheaval, the depression representing a lagoon which has now disappeared, with marks indicating the retreat of the water. Around the greater part of the coast, except on the west, old beaches of coral fragments are found a little distance inland.

The island is bordered by a fringing reef 100 yd. wide except on the east side, where there is an extensive shoal area. There is no anchorage, but landing may be made on soft coral sand through a gap blasted in the reef on the north-west side.

Climatic data are scanty, but the climate appears to be very dry. Recorded temperatures for a few days in August gave 88° F. as the maximum and 73° F. as the minimum. Evaporation on the island is great, and resembles that of a desert station. Water is probably to be obtained only by rain catchment.

Jarvis was formerly an important source of Pacific phosphate. It was worked by American interests extensively from 1858 to 1879. The greater part of this deposit has now been removed, leaving a shallow soil with a low phosphate percentage. In the central depression the soil varies from a brown mould with little or no sand admixture to a light brown sand, all with a high proportion of organic matter. But on the beach crest and its landward slopes the soil is a light greyish brown coral sand with a slight admixture of organic matter. In the central part of the island a gypsum hard pan is extensively developed, in parts replaced by a phosphatic pan.

The vegetation of the island as a whole is scanty. No trees grow there and the sparse growth of herbs and shrubs is in a partly dry condition. The vegetation of

the central depression is very open, and consists mainly of *Sesuvium portulacastrum* (the most vigorous species), *Sida fallax* (mostly dead), *Boerhaavia tetrandra*, *Lepturus* bunch-grass (in general not thriving well) and *Portulaca lutea*. The same species, with the exception of *Sesuvium*, occur on the land crests and slopes, but there constitute a fairly continuous cover, adapted to the dry shifting sands. Only eight species of plants in all have been recorded from the island. Animal life, except for sea birds, is scarce. There are lizards, but no land birds.

Jarvis is supposed to have been discovered by Captain Brown of the *Eliza Francis* in 1821. It was formerly marked on most maps as a possession of Great Britain, but was claimed by the United States in 1935, and a party of American colonists was landed there. In 1938 there were three inhabitants, but the number has recently been reported to be about thirty. The settlement, Millersville, has houses of wood and stone, and is equipped with refrigeration. An iron tank of 1,000 gal. capacity serves as a water reserve. Weather observations have been made regularly from the island since the occupation. Sea communication depends upon the visits of U.S. coastguard cutters. A powerful two-way W/T station has been established.

Malden Island

Malden island (lat. 4° 03′ S, long. 155° 01′ W) is a flat, triangular coral island, measuring about 5 miles in greatest length, east and west, and 4½ miles in greatest breadth. According to a rough survey it covers about 19,700 acres, of which about 9,000 acres are occupied by a lagoon in the east-central part (Fig. 150).

At an earlier period the lagoon was probably open to the sea by one or more channels, but it is now entirely enclosed. The lagoon rises and falls with the tide, alternately covering and exposing considerable areas of muddy flat land. But no brine shrimps are found in the water, indicating that its salinity is low. On the other hand, a species of fish exists there, and from its habit evidently passes to and from the ocean by subterranean fissures in the coral rock. Owing to evaporation from the lake and recharging from the sea, large deposits of calcium sulphate and calcium carbonate have been formed, especially at the western end, towards which the winds are generally blowing, and which is farthest from the fissures through which the sea water enters.

The island has around its margin a sandy rim or beach crest, the lowest part of which is at an elevation of about 15 ft. on the east side; on the north-west, south-west and west sides its height is from 25 to 30 ft. above sea level. The beach rises sharply from the water's edge, grading from coarse coral sand through fine gravel into coarse gravel and coral pebbles about 1 in. in diameter. These last lie at the steepest slope which gravity and the wind will allow. Above them the coral debris becomes still coarser and the slope steeper as the interlocking pieces support one another. A patch midway between the waterline and the beach crest has an angle of about 35°. Extending inland, successive ridges have been formed by wind or earlier wave action, many of them as much as 8 ft. high. The outer ridges may be rapidly formed. Before a storm in December 1868, the lower part of the beach was sloping so that one could conveniently walk along it, but the large rollers which then came over the reef piled up the whole of the beach with material from the reef edge, forming a high ridge of which the sea face was almost perpendicular.

The shore, except for an open beach about 200 ft. long, is bounded on all sides by a narrow fringing reef, not exceeding 200 yd. wide in most parts, and cut by small channels. Anchorage off the island is precarious. During the phosphate period vessels moored at buoys off the western end. Boats can land on the soft sandy beach, which is at the western end, but strong currents make it dangerous. An old pier here is not suitable for use.

Winds in the vicinity are fairly steady from the east. The temperature seldom rises appreciably above 92° F. or falls much below 72 F. Rainfall is said to be about 27 in. per annum on the average, but is very variable; the rain is most apt

to occur between January and May (Figs. 140, 141). Fresh water is scarce. The company which formerly worked the island got water for its labourers from condensers, and a storage well was found to be dry in 1936. The presence of wild pigs on the island, however, indicates the existence of some source of water, though this is possibly only the lagoon. It is said that in the rainy season several fresh-water ponds form in depressions excavated by the phosphate workers around the lagoon margin.

Vegetation is sparse, consisting of about ten species, mainly of grasses, herbs and low bushes of *Sida fallax*. The only trees in 1930 were about a dozen stunted *Pisonia* on the beach crest and a few coconut palms planted by the phosphate

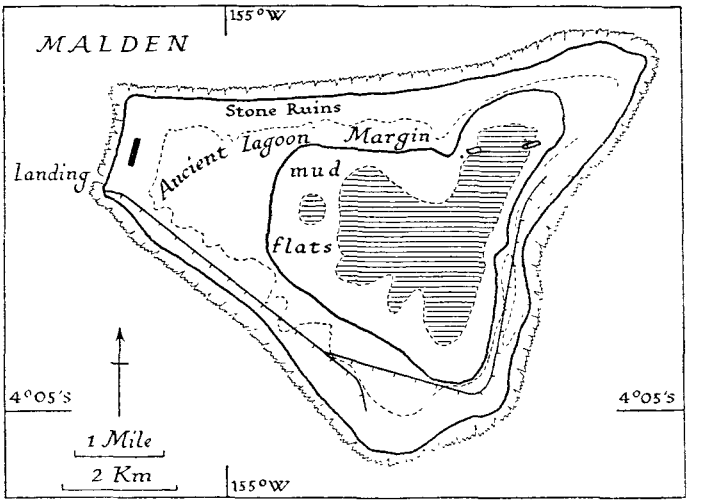


Fig. 150. Malden

The lagoon is shown as it was in 1924; the shaded area represents its extent at low water and the black line the extent at high water, when the mud flats were covered. An ancient lagoon margin is shown by an outer broken line. The tramway was abandoned in 1927, as also was the settlement, shown to the north-east of the landing. The stone ruins are ancient Polynesian structures; most common in the area indicated, they also occur on the south-west side, between tramway and beach. Based on: (1) K. P. Emory, *Bernice P. Bishop Museum Bulletin*, no. 123, p. 25 (Honolulu, 1934); (2) E. H. Bryan Jr., *American Polynesia*, p. 151 (Honolulu, 1941).

workers. The fauna comprises semi-wild pigs, a few goats, cats (all having been introduced), and sea birds, mainly sooty tern in two large colonies.

The island was discovered by Captain Byron of the *Blonde*, in 1825, and named after Lieutenant Malden, who went ashore there.

It is now uninhabited. From about 1860 to 1927, it was worked for phosphate by a Melbourne company first known as Grice Sumner and Company, and later as the Malden Island Proprietary, Ltd. When it was evacuated, the ground was left in very rough condition owing to the phosphate workings. A tram line then used, however, was in fair order in 1936. The labour force employed was mainly from Niue, and a few Aitutaki men were used to man the boats. The settlement was on the western point of the island. A considerable amount of phosphate was exported; in 1912, for instance, its value was about £18,000.

The island is of archaeological interest by reason of a number of structures of coral slabs, of the type of the small shrines found elsewhere in Polynesia, and some graves. These have been described as relics of an ancient civilization, but scientific study shows that they are consistent with the former habitation of the island by a small Polynesian population of one hundred or two hundred people (Fig. 151).



Fig. 151. Ancient Polynesian stone structure on Malden

The erect slabs are probably the remains of a small shrine or temple where offerings were made to the gods. Based on a photograph by K. P. Emory, *Bernice P. Bishop Museum Bulletin*, no. 123, Plate 5B (Honolulu, 1934).

Starbuck Island

Starbuck island (lat. 5° 37′ S, long. 155° 55′ W) lies about 108 miles south-south-west of Malden. It measures about 5 miles long by 2½ miles in greatest width, and has a greatest elevation of about 15 ft., at the beach crest.

The island is composed of low ridges of coral blocks and fine coral, powdered almost to the consistency of sand, and presents a strong white glare in the sun. In dull weather or at night it is inconspicuous, and the currents sweeping past it render it dangerous to shipping; seven wrecks were counted there by Arundel when he landed in 1870. Behind the beach crest the centre of the island is slightly depressed, and though there is no major lagoon, there are several small salt lagoons near the eastern end. Around these large quantities of salt have crystallized. The lagoon margins are soft and dangerous to approach.

The steep beach is surrounded by a fringing reef, 1,000 yd. or so wide. There is no safe anchorage, but landing is made in an opening which has been blasted out of the reef near the western point. Heavy surf renders this difficult and often unsafe.

There is no fresh water on the island and rainfall appears to be small. Vegetation consists of a few species of herbs and a low shrub, and is sparse. The fauna is very limited, but there are many sea birds.

Starbuck was discovered by Captain Valentine Starbuck in the English whaling vessel *L'Aigle* in 1823. Commodore Swinburn in H.M.S. *Mutine* took possession of it for Great Britain in 1866. There were formerly considerable phosphate deposits, which were worked by Arundel with about 100 native labourers from 1870 till about 1890 by licence from the British government. The settlement was on the west side, and is now in ruins. Efforts to establish coconut palms there at various times failed, and the island is now uninhabited.

Vostok Island

Vostok island (lat. 10° 05′ s, long. 152° 23′ w approx.) lies about 385 miles south-south-east of Malden. It is a small low island of coral formation, about 1,400 yd. long in a north and south direction. It has no lagoon, but is surrounded by a fringing reef 100 yd. or so wide, with sunken reefs extending to north and south, for 400 or 500 yd. (Fig. 152).

Anchorage is not good, though it may be possible off the western point. Landing can be made in calm weather through a narrow break in the reef just north of this. Swift currents sweep past the island in a westerly direction with a small eddy on

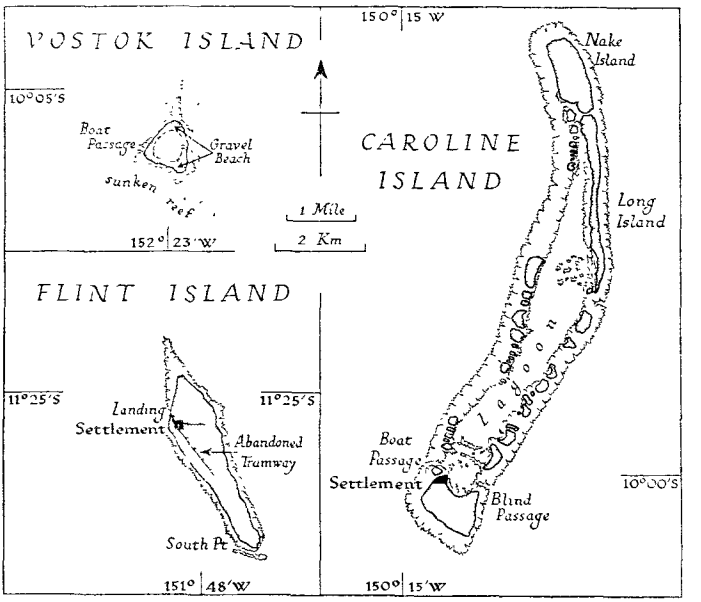


Fig. 152. Three of the southern Line islands

Based on: (1) Admiralty chart no. 979; (2) E. H. Bryan Jr., *American Polynesia*, pp. 136, 139, 143 (Honolulu, 1941).

the leeward side. On the weather side the sea breaks heavily. The shore is a gravel beach.

The height of the island is about 15 ft., but the central part is covered by a thick growth of *Pisonia* trees the tops of which reach to about 80 ft. above sea level, in a dense canopy. The soil under the trees is rich in humus and moist. The inner part of the gravel beach has a low scattered growth of herbs. No information is available about climate, but there is no fresh water. Sea birds comprise the principal fauna.

Vostok was discovered by Bellingshausen in 1820 and named after his vessel. Though included among the islands investigated for phosphate by Arundel, and though an occupation licence was issued to him in 1874, Vostok does not seem to have ever been worked and its value is probably negligible. The island has been leased to a New Zealand firm, whose representative planted 100 coconut seedlings there in 1922, but no use has been made of it and it is uninhabited.

Caroline Island

Caroline island (lat. 10° 00′ S, long. 150° 14′ W) lies about 400 miles east of Tongareva in the Cook group. It is a crescent-shaped narrow atoll consisting of about twenty-four islets, and measures about 5¾ miles long north and south by about 1 mile in greatest width, near the southern end (Fig. 152). The greatest land height is 15–20 ft.

There is no anchorage, and no ships pass into the lagoon. Landing is made at the north-west point of the southern islet. At high tide boats can reach the shore by a narrow passage in the reef here; at low tide it is necessary to wade knee-deep in water for about a quarter of a mile, since the reef does not dry.

The weather is warm but pleasant, with sudden showers especially at night. The prevailing winds are the south-east trades, varied by winds from north and east, particularly in April and May. In 1878 a hurricane destroyed many coconut palms. Fresh water is obtained from a cistern by rain catchment, but may also be had by digging; there were in 1883 two wells on South islet and one on Nake islet.

The islets are fairly well wooded. There are low trees of pandanus, *Tournefortia*, *Cordia*, *Morinda*, with a few taller *Calophyllum* and *Pisonia*, but most prominent are the coconut palms. Sea birds and fish are abundant there; the only land mammals are reddish brown rats.

Graves containing stone adze blades, and the remains of temple platforms, especially on the northern islets, indicate that the island was formerly inhabited by Polynesians. European discovery was made by Captain Broughton, in H.M. sloop *Providence* in 1795, and the island was named in compliment to the daughter of the then First Lord of the Admiralty. The British firm of Collie and Lucett established a small native agricultural settlement there in 1846. In 1868 possession was taken for Great Britain by Captain Nares, H.M.S. *Encounter*. (The ship is given as H.M.S. *Reindeer* in some accounts.) He reported twenty-seven persons living in the settlement on the southern islet, engaged in rearing stock, pigs and poultry, salting fish, planting coconuts and extracting coconut oil. Phosphate was exported from the island between 1873 and 1895 under the management of J. T. Arundel, a total of about 10,000 tons being shipped. Some coconut palms were also planted at that time, and more subsequently, but many died from disease and drought. There were estimated to be 13,000 palms in 1929. The island was worked continuously as a coconut plantation since 1916, by a New Zealand firm, Messrs S. R. Maxwell and Company, Ltd., till 1934; the company then went into liquidation and the plantation, together with that on Flint, was carried on by the administrator of the company's affairs. From 1929 to 1934 export of copra was estimated at 14 tons per annum, but may have increased since then. Until 1936 labour was obtained for Caroline, as for Flint, from Tahiti, but in that year the French authorities forbade further recruiting, and the population was reduced to a couple of Tahitian families.

In 1883 Caroline was visited by a U.S. government expedition in the U.S.S. *Hartford* to observe the eclipse of the sun on 6 May, the island being the only place on the earth from which the eclipse was visible in its totality. The Royal Society also sent two British observers, and the French government sent an expedition in *L'Eclaireur*.

Caroline was visited until recently about once in three months by the company's schooner from Tahiti, calling also at Flint. There are no other communications.

Flint Island

Flint island (lat. 11° 25′ S, long. 151° 48′ W) lies about 125 miles south-west of Caroline. It is a low coral island, in shape somewhat resembling a kite, about 2½ miles long from north-west to south-east, and ½ mile in greatest width, tapering towards both ends. Its maximum height is 22 ft. (Fig. 152).

The island has no proper lagoon, but excavations for phosphate have filled with brackish water, and formed two or three small lakes. The island is bordered by a narrow fringing reef, which extends for nearly half a mile off the northern point. On the east side the surf breaks heavily, and even to some extent on the west (lee) side. Anchorage is not safe, and the only landing is through a narrow boat channel which has been blasted out on the north-west side; this is difficult to negotiate. Heavy seas often render it impossible to communicate with the shore.

The climate is hot but pleasant. In December and January the maximum temperature is about 91° F. and the minimum about 76° F. Water is provided by a cistern, taking roof catchment of rain.

The original vegetation of Flint has been almost destroyed, and the island is now a cultivated copra plantation. Introduced weeds are abundant around the houses and in the plantation, and several edible or ornamental plants are grown; the papaya grows apparently spontaneously in places. A total of thirty-six species of plants has been recorded.

No exact information about the discovery of Flint is available, but it is believed to have been about 1801. The position of the island was fixed by the U.S. brig *Porpoise* in 1841, in connexion with the work of the U.S. Exploring Expedition. Between 1872 and 1890 the island was worked for phosphate under the control of J. T. Arundel. The phosphate was carried to the landing on a tramway, which was later used for transporting copra, and appeared to be in good condition in 1936. In all some 30,000 tons of phosphate was shipped from Flint. Under the name of 'Coral Queen Guano', with an average of 45–60 % phosphate of lime, it was sold in Australia and California. To provide room for the phosphate working and for coconut planting a forest of *tou* (*Cordia subcordata*) was cleared, and between 1872 and 1896 several hundred logs were shipped to San Francisco, where the timber was used in furniture making.

Coconut palms were first planted about 1875, and on the exhaustion of the phosphate the island was developed as a plantation. In 1911 it was taken over by S. R. Maxwell and Company. In 1900 there were estimated to be 20,000 coconut palms, by 1910 there were 25,000, and in 1922 there were 30,000. At this date the entire plantation area of 600 acres had been covered. Between 1910 and 1922 a total of 2,228 metric tons of copra was exported, and between 1922 and 1934 a total of 2,769 metric tons. An average annual export of over 200 tons has probably been maintained since. There was a break in the working of the plantation in 1936–7 owing to the temporary stoppage of labour from Tahiti.

Like Caroline, Flint was selected for eclipse observations; in 1908 the British Eclipse Expedition and an expedition from the Lick Observatory visited the island.

Sea communication, as with Caroline, was maintained until recently by visits from the company's schooner from Tahiti. There are no signal communications.

BAKER ISLAND AND HOWLAND ISLAND

Baker Island

Baker island (lat. 0° 14′ N, long. 176° 28′ W) is of coral formation, oval in shape, and about 1 mile long and ⅔ mile wide. Its highest point is about 20 ft. above sea level (Fig. 153).

It is surrounded by a fringing reef, from 100 to 200 yd. in breadth, and awash at low water. Landing is difficult, even on the west side, which offers the only practical access. A marked phenomenon is the shifting of sand at beach level with seasonal changes in the wind. In February or March, with the south-easterly winds, the sands of the southerly spit begin to be washed round to the west side, forming there a beach flat 200–300 ft. wide, nearly covering the shore platform to a depth of 8–10 ft. With the change to the north-easterly winds in October or November the

swell sweeps along the western shore and moves the sand back again till only a narrow strip remains, while on the south side the beach has been extended again.

The interior of the island, behind the beach crest, falls slightly towards the centre. The surface is almost flat, except for some small mounds to the north-east and two small depressions at the eastern end, all probably the result of former excavations for phosphate.

Little is known of the climate beyond the considerable heat and scanty rainfall. The winds prevail from the east varying slightly during the day time; they may back to the south-west for a short time during squalls. The highest velocity is about 15 miles per hour in normal conditions. The barometric pressure is practically constant except for diurnal variations. Rain falls in light showers not infrequently,

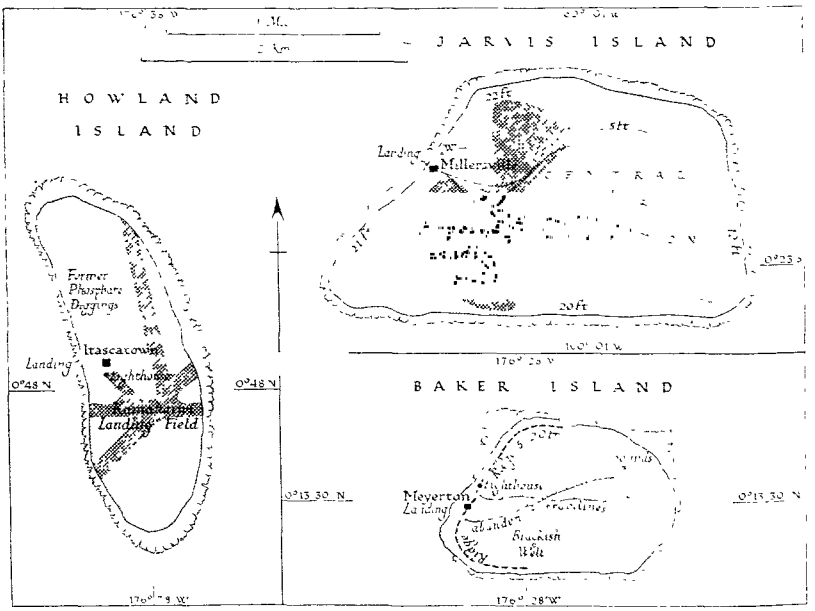


Fig. 153. Three equatorial islands

Based on: (1) Admiralty chart no. 979; (2) E. H. Bryan Jr., *American Polynesia*, pp. 44, 48, 155 (Honolulu, 1941).

but heavy showers are rare. During four 'winter' months from October to February 1859–60, rain fell twenty-three times, the heaviest shower yielding about a quarter of an inch of rain, and the total for the period being 1·8 in., of which nearly half fell in December. Formerly one or two wells in the centre of the island supplied water, but with too much lime and salt in it to be suitable for drinking, and there is no fresh water except what may be obtained by catchment, a precarious source.

The greater part of the island is covered by a light brown dry sand, with a low percentage of organic matter; much of the surface has been denuded of its soil by the extraction of phosphate, leaving the coral conglomerate bedrock exposed. In places this is found as a brown phosphatic rock. The outer beach slope is of coral shingle.

The vegetation is poor. There are no trees. Only fifteen species of plants have been found there, and only a few of them are abundant. The commonest types are

low tufts of *Lepturus* bunch-grass and *Panicum* grass, especially on the beach crests, while herbs of creeping habit, *Portulaca* and *Boerhaavia*, are found in association in the interior (Plate 97).

The fauna is likewise very limited. The Norway rat is the only mammal, the rabbits said to have been introduced by a phosphate company having disappeared. There are no land birds, and no land shells. Sea birds, however, are very common.

The island is said to have been discovered by Captain Baker, of the whaler *Gideon Howland* in 1832, and was worked for phosphate by the American Guano Company from 1859 to 1878, though with considerable difficulty owing to the absence of anchorage. The British company represented by J. T. Arundel began operating there in 1886, after the Americans had abandoned the island, using a labour force of about 100 men from Niue and the Cook islands. Work ceased there in 1891, and the island remained uninhabited until as a result of the United States claim in 1935 a few Americans of Hawaiian blood were landed there. They have built a lighthouse and substantial dwellings, the settlements being called Meyerton.

Sea communication is maintained by occasional visits of U.S. coastguard cutters. There is a small W/T station.

Howland Island

Howland island (lat. 0° 48′ N, long. 176° 38′ W) is of coral formation, in shape like a bean, about 1½ miles long and 1,000 yd. wide, and from 18 to 20 ft. high. It has no pronounced beach crest or central depression and except for a few artificial mounds and trenches the surface is practically flat. The island is bordered by a narrow fringing reef, with landing on the west side (Fig. 153).

The beach on the western (lee) side is sandy and low; that on the eastern side is higher, more abrupt and covered with brown coral shingle and slabs of coral conglomerate. Since the eastern side is subject to the prevailing trade winds, the break of the surf is very heavy (Plate 94). There is usually a surf even on the westerly side. The landing is apt to be difficult, and sometimes there are violent gales from the west.

Conditions of climate, soil and vegetation are almost the same as those on Baker island. On Howland island, however, some heavy phosphate soil is still in place, a brown moist mould with a high percentage of organic matter. The vegetation, though forming an almost continuous cover over the island, has only six species, but as on Baker island the bunch-grass and the creeping *Portulaca* and *Boerhaavia* are the common types, with similar distribution. On Howland island, however, there are several groves of *Cordia subcordata*, averaging about 10 ft. high, and covering about 3 acres, associated with the disturbed phosphate soil in the south central part of the island. The trees are old and crooked and much branched, and seem on the verge of dying, though they have apparently been in that condition for the last sixty years or more. Some thousands of coconut palms planted towards the end of the nineteenth century all died off in a drought. Slightly brackish water is found by digging.

There is much bird life on the island and at one time it was overrun by Polynesian rats, of both the brown and the black variety.

Excavations and stone slabs in the centre of the island show evidence of a former native population, but there were no inhabitants when it was first discovered by Europeans. It appears to have been named by Captain Netcher, of the New Bedford whaling vessel *Isabella* in 1842, but almost certainly it was sighted by whalers one or two decades before that. The island was worked for phosphate by the American Guano Company from 1856 or 1857 till 1878, the peak of the operations being reached about 1870. In that year 7,600 tons of phosphate were loaded on to seven vessels between August and December. Between 1886 and 1891 the island was reworked by a British firm which J. T. Arundel represented.

American colonists were established on Howland in 1935, and the occupation has since been maintained, the settlement being called Itascatown after the U.S.

coastguard cutter *Itasca* which landed the first settlers. A landing ground with three runways was laid down on the island in 1937, and is known as Kamakaiwi Field, after one of the colonists. A lighthouse known as Amelia Earheart Light was also built; this was named after the woman aviator who was lost on a flight from Lae (in New Guinea) to Howland.

Sea communication with Howland is maintained by occasional visits of U.S. coastguard cutters.

THE PHOENIX GROUP

The Phoenix group consists of eight small islands scattered between approximate lat. 2° 50′ and 4° 40′ S, and long. 170° 43′ and 174° 33′ W, with a total land area of about 18 sq. miles. The group lies on the direct route between Fiji and Hawaii, and it was on Phoenix island that Kingsford Smith looked for an emergency landing place had it been necessary on his flight across the Pacific in the *Southern Cross* in 1928.

CANTON ISLAND

Canton island (lat. 2° 49′ S, long. 171° 43′ W) is the most northerly island of the Phoenix group. It is of typical atoll formation, a coral rim from 100 to 500 yd. wide and 10–12 ft. high enclosing a pear-shaped lagoon about 9 miles long by 4½ miles broad at its widest part (Fig. 154).

On the western side of the lagoon there are four openings in the reef, but all are dry except the southernmost, about 150 yd. wide, through which launches and lighters can pass, though numerous coral heads just inside render it impossible for craft of any size to enter. The reef is steep-to. The coral shelf extends only from 200 to 400 yd. from the shoreline, after which depths drop off from 100 to 300 fathoms. Anchorage is in 10 fathoms on the west side southward of the boat passage, on a bank of coral sand built up by the tidal flow from the lagoon. It is not suitable for any vessel drawing more than 24 ft. The tidal stream in the lagoon passage runs strongly, from 6 to 8 knots.

The greater part of the lagoon, especially in the western part, is honeycombed with coral reefs and heads close to the surface, but there is a comparatively clear area in the south-eastern part. The southern part of the western half has been blasted out by Pan-American Airways to form a safe landing basin for seaplanes. The beach on the ocean side of the atoll rises steeply from the reef to a crest, and is composed of alternate stretches of coral sand and fragments of reef rock. On the lagoon side the beach is lower, and in general sandy, rendering landing easy. On the north-east side of the lagoon there is an old coral slab jetty formerly used in loading phosphate into lighters. On the west side, close to the inner end of the boat passage, there is a concrete pier in connexion with the airport, and also a small boat dock.

The land surface of the atoll is flat, and composed primarily of coral shingle and sand. Vegetation is scanty, there being only a dozen species, including a few coconut palms, the remnant of some hundreds planted in 1915, and a growth of low *Scaevola* brushwood, more particularly on the south side. At one time the island was popularly known as 'Lone Palm Island' because of a single palm surviving from many planted towards the end of the nineteenth century. Lizards, rats and birds (sea birds and migrants of twenty-three species) are found on the island. Fish are plentiful, though some species in the lagoon may be poisonous. Turtles come up on the sandy beaches to lay their eggs.

Canton was discovered independently by several vessels, most of them American whalers, for which it was a resort on account of the anchorage off the lagoon entrance. The earliest visit was probably about 1820. The island was named after the New Bedford whaling vessel *Canton* which was wrecked there in 1854.

Phosphate was extracted from the island in 1885–6, but after that it was of negligible importance until its value for a trans-Pacific air service was realized. The lagoon provides the most convenient shelter for flying boats from Honolulu, about 1,660 miles away, *en route* to the south-west Pacific.

In 1937 the island was visited by parties from the United States and New Zealand to study the eclipse of the sun, on 8 June. The New Zealand party planted 1,000 coconuts. In August 1937 a British technical party was landed there and

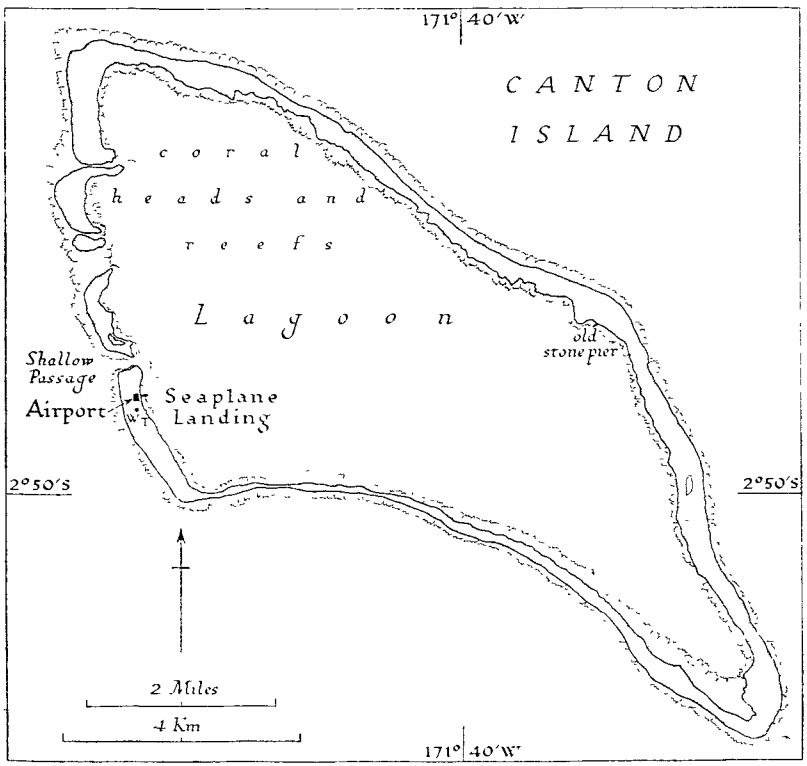


Fig. 154. Canton

Much of the southern part of the lagoon is also cumbered by coral. Based on: (1) Admiralty chart no. 184; (2) E. H. Bryan Jr., *American Polynesia*, p. 52 (Honolulu, 1941).

a similar American party followed in March 1938. After the negotiations already described (p. 473) the two settlements were established side by side, south of the lagoon entrance. At the one the British administrative officer for the Phoenix group lives; at the other the airport and hotel staff of Pan-American airways. The hotel, built of composition material brought from San Francisco, has 24 double rooms.

Facilities in addition to the hotel include a water evaporation system of two units capable of 1,000 gal. per day, a meteorological station, a truck and a crane. In 1941 a Clipper called weekly from either Honolulu or New Zealand, bringing milk, meat, fruit and green vegetables. An official of the Hawaiian Sugar Planters' Association

inspected the aircraft on its arrival from New Zealand, for bugs injurious to the sugar industry.

Apart from air services the only communication with the island is by U.S. coast-guard vessels from Honolulu several times a year; commercial vessels have made occasional calls. A W/T station is maintained, and there is also a telephone system, and a post office.

Phoenix Island

Phoenix island (lat. 3° 42′ S, long. 170° 43′ W) is the eastern island of the group. It is pear-shaped, about 1,300 yd. long, ½ mile wide, and about 18 ft. high at the beach crest. A very shallow brackish lagoon occupies the centre, but its size fluctuates considerably.

A narrow fringing reef surrounds the island, with a break on the western side, affording good landing. Landing can also be effected in suitable weather through a small passage in the reef northward of the middle of the east side of the island. Anchorage has been obtained in 11 fathoms off the middle of the western side.

The surface of the island is sandy, sparsely covered with vegetation about 2 ft. high. Each of half a dozen species of plants dominates a different area: *Lepturus* bunch-grass at the north-west point and along the west beach crest; *Boerhaavia* and *Portulaca* on the south and south-west; a mat of *Sesuvium* along the west border of the lagoon; and small areas of stunted *Sida* and *Triumfetta* (beach runner) amid the broken coral ridges on the east side. Rabbits, descended from some left by H.M.S. *Egeria* in 1889, are numerous, as also sea birds. These latter include sooty, grey and white terns, four species of petrels, a frigate bird, boobies, and migratory plover and curlew. There are apparently no rats or lizards, but insects are abundant. There is no fresh water on the island.

The discoverer of Phoenix has not been identified. It has been stated that the island was sighted by an American vessel of that name prior to 1828, but no further information is available. Phosphate was extracted there from about 1862 to 1871 by the Phoenix Guano Company, after which the island was abandoned. In 1889 possession of it was taken for Great Britain by Commander Oldham, H.M.S. *Egeria*. In 1937 the island was explored by officials of the Gilbert and Ellice colony to examine its suitability for settlement, and several experimental wells were dug. Though they were sunk to over 12 ft. water was found in only two, and was too salt to drink. It was considered that its small size and lack of water unfitted it to be more than a tributary to the main islands.

Birnie Island

Birnie island (lat. 3° 35′ S, long. 171° 31′ W), lies 50 miles west of Phoenix. It is pear-shaped, and measures about 1,300 by 600 yd. in greatest width, with a greatest height of 12 ft. or more at the beach crest. From this the slope trends gradually inwards down to sea level at a small shallow lagoon on the eastern side. The size of the lagoon has been given as 300 yd. long by 50 yd. wide, but it probably varies; one account gives its depth as 6 ft., while another states that it was nearly dry.

Most of the eastern (weather) side of the island is rough, with slabs of coral rock, and broken coral piled up in a steep beach; the northern half of the island is flat and fairly smooth. Anchorage has been found in 9 fathoms on the western side, and landing can be made with caution in suitable weather on a sandy beach there. The island is bordered by a narrow fringing reef which extends for some distance in sunken form off the northern and southern points.

There is no fresh water. Vegetation is scanty, and until recently consisted of low herbs of the species common to the area. In 1939 about one-third of the island was planted with coconuts as part of the Gilbert and Ellice government colonization project, but in the conditions of drought then prevailing little result may have been

achieved. It was estimated that when fully planted the island should support 2,500 coconut palms.

Birnie is understood to have been discovered by Captain Emment. It was surveyed in 1841 by the ships *Peacock* and *Flying Fish* of the United States Exploring Expedition, and J. D. Dana the scientist gave an account of it. The island was not worked at any time for phosphate. In 1889 it was placed under British protection by Commander Oldham of H.M.S. *Egeria* in view of the possibility that it might be required in connexion with the trans-Pacific cable then under discussion. After being included in 1937 within the boundaries of the Gilbert and Ellice Islands Colony, Birnie was declared to be a sanctuary for birds by proclamation of 21 June 1938.

The island is uninhabited.

Enderbury Island

Enderbury island (lat. 3° 08′ S, long. 171° 05′ W) lies 37 miles east-south-east of Canton. It is slightly less than 3 miles long by about 1 mile wide, and is roughly rectangular in shape with the long axis running nearly north and south. Unlike Canton, Enderbury is a solid land mass, with its former lagoon reduced to a small shallow pond a few hundred yards across, dotted with sand islets and covered with a mat of *Sesuvium*. The height of the beach crest is mainly between 15 and 22 ft.

Behind the beach crest the land declines to a central depression about 4 ft. above sea level, part of this being occupied by the lagoon. The surface of the island is rough, being covered with loose irregular lumps of coral piled in long ridges. Much disturbance of the surface is due to extensive phosphate diggings, especially in the northern part (Fig. 155).

A narrow fringing reef of coral borders the island; it is steep-to, and anchorage, off the north-east point in 23-30 fathoms, is poor. Landing is made on the west side, towards the south-west point, but it is difficult. Most of the beach is composed of slabs of coral rock and coral rubble, alternating with short stretches of sand. Jagged coral fragments compose much of the surface at the northern end of the island (Plate 95).

Winds at Enderbury blow steadily from east-north-east to east-south-east for the greater part of the year. Rain squalls are frequent, but brief, and cannot be depended upon as a source of fresh water. There are said to be several seeps or water holes, but they are brackish, and wells dug in 1937 gave water too salt for use. Vegetation consists of bunch-grass, herbs, *Sida fallax*, and a few clumps of *Tournefortia* and *Cordia* trees. There are also three groups of coconut palms, each surrounding a moist depression; they numbered thirty-one in all in 1938. Sea birds (Plate 96) are abundant on the island, and there are many rats. Fish are plentiful, all common species apparently being edible.

Enderbury was discovered and named in 1823 by Captain J. Coffin of Nantucket, when master of the British whaling vessel *Transit*. The name is a misspelling for Enderby. The island was visited on two occasions and surveyed by vessels of the United States Exploring Expedition. Phosphate began to be extracted there about 1860, by the Phoenix Guano Company, but the peak of activity came during the few years after 1870; work ceased there in 1877. Some years later the island was reworked under the management of J. T. Arundel. The quality of material from the early workings was about 80 % calcium phosphate, but that of the later extraction gave a yield of about 50 %.

The island remained unoccupied for many years until after its inclusion in the Gilbert and Ellice colony in 1937. In March 1938 it was occupied by an American party, and jurisdiction over the island was settled by the exchange of notes already mentioned (p. 473). A lighthouse and substantial dwellings have been built. In 1941 there were four Hawaiians there.

Sea communication is maintained by occasional visits of U.S. coastguard vessels, and there is W/T communication with Canton.

Sydney Island

Sydney island (lat. 4° 27′ s, long. 171° 16′ w) is the south-eastern island of the Phoenix group. It is a small triangular atoll with sides about 2 miles long, with a roughly circular very salty lagoon in the centre (Fig. 155). The lagoon, about 1 mile in diameter and up to 15 or 18 ft. deep, has no outlet to the sea and is choked with small islets and shoals. In the south-east of the island is a series of small slightly brackish ponds, in an area from which phosphate was removed. These are now

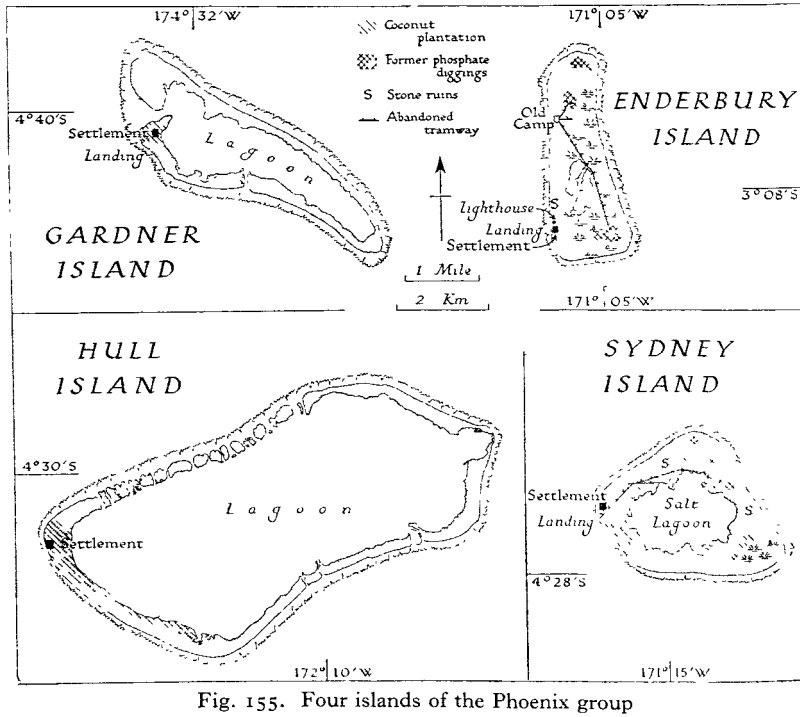


Fig. 155. Four islands of the Phoenix group

The abandoned tramway beds on Sydney have now been converted into roads. The areas shown as marshy on Sydney and Enderbury are not permanent marsh in all cases; they are sandy depressions with a growth of herbs and are occasionally covered with water. Based on: (1) Admiralty chart no. 184; (2) other official sources; (3) E. H. Bryan Jr., *American Polynesia*, pp. 56, 68, 72, 80 (Honolulu, 1941).

practically dry. The height of the beach crest is about 15–20 ft., and behind this the land slopes gradually towards the lagoon.

The island is bordered by a fringing reef from 50 to 200 yd. wide. Immediately off the reef are depths of 10–20 fathoms, and there is anchorage on the western side, in 9 fathoms. Landing may be made through reef fissures on the south-west and on the south, but is not easy, and at times is dangerous. The beach is mainly sand, but is composed in parts of coral rubble and slabs of coral rock.

Water is available from cisterns, and from wells, which however are inclined to be brackish in dry weather. Vegetation is more abundant than on the northern

Phoenix islands. On the north and south sides there is open scrub forest, of *Tournefortia, Pisonia, Cordia, Morinda* and *Scaevola*, with low shrubs, herbs and vines, while on the north-east side the vegetation forms a series of dense almost impenetrable thickets. On the western side and near the south-eastern corner there are coconut plantations, which have developed well. Bird life is similar to that on the other islands, but not so abundant. Domestic pigs have run wild. Rats, lizards and many kinds of insects are present. Fish are plentiful; they are sometimes stated to be poisonous, but it is only the reef species, which feed on seaweeds, which are so; other types are excellent eating.

Sydney was discovered and named by Captain Emment, apparently in 1823. Before its discovery by Europeans it had been inhabited at one time by Polynesians, as evidenced by a fishpond, graves and other stone ruins. Most of these are in the north of the island.

In 1883 the first shipping of phosphate from the island began, the work being under the direction of J. T. Arundel; exploitation of the deposits ceased in 1885, by which time about 7,000 tons of the material had been exported. But at the same time the work of developing the island as a coconut plantation was begun, and by 1889, when Sydney was formally placed under British protection and surveyed by Commander Oldham of H.M.S. *Egeria*, a great part of the island had been planted. In 1897 Mr Arundel's interests in the island were transferred to the Pacific Islands Company, Ltd., which in 1902 sold them to Lever's Pacific Plantations Limited. The lease granted to this company by the Colonial Office, in succession to earlier leases, fixed a royalty of 2*s*. per ton of copra exported. In the early years this company improved the island by blasting a channel through the reef and setting up a 15,000 gal. cast-iron tank for storage of drinking water. Later their interest declined, till the export of copra from Sydney and Hull in 1914 was only 5 tons. In this year the company sold the lease of Sydney and the other islands in the Phoenix group (from which McKean and Enderbury were then excluded) to the Samoa Shipping and Trading Company, Ltd., of Sydney (N.S.W.); this company had for some time undertaken the work of collecting the copra from Sydney and Hull for Lever's company. The enterprise, however, was not very successful, annual output of copra was only about 50 tons from Sydney and 70 tons from Hull, and in 1925 Sydney was abandoned. Burns, Philp (South Sea) Company, Ltd. then took over the lease of the six Phoenix islands but owing to low copra prices, in spite of a remission of royalty, the islands were abandoned from 1932 to 1937. In 1938 the planted area was estimated to be 300 acres on Sydney.

As a result of the investigations of the Gilbert and Ellice Islands Colony government, and incorporation of the group in the Colony, a party of forty-one Gilbert islands settlers was landed there in December 1938, and followed by another of 108 settlers in May 1939. Other settlers landed later brought the total population to 260 in 1940. It is estimated that when full planting has taken place the island will support a total of about 500 settlers. The Gilbertese name for Sydney is Manra. At the settlement on the western side of the island water and other facilities for communal life have been established. An Administrative Officer has resided there for considerable periods since the colonization began.

Communication is maintained somewhat irregularly by vessels with the Gilbert and Ellice colony. A W/T station was set up on the island in 1938. It communicates with Ocean island and other islands of the colony. Excellent roads, based on tramways, traverse parts of the island.

Hull Island

Hull island (lat. 4° 30′ S, long. 172° 14′ W) lies about 60 miles west of Sydney. It is an atoll of roughly lozenge shape, with a land rim about 500 yd. wide enclosing a lagoon about 6 miles long by 2 miles wide.

The lagoon, with depths of 50–60 ft. in the centre, is shoal at both ends and contains numerous coral heads. On the north and south sides the land rim is cut by

narrow shallow entrances, the number and position of which vary as storms break through and shift the coral sand. The usual number is about twenty on the north side and four on the south side, as shown in Fig. 155. Only two passages are possible, even for boats. The best entrance, near the north point on the north-west side, has a depth of 4 ft., in part cleared by blasting by U.S.S. *Bushnell* in 1939. A fringing reef borders the atoll, in general to a width of about 100 yd. Anchorage for small vessels, in easterly winds only, is in a depth of 10 fathoms about 100 yd. off the reef edge on the western point; anchorage for vessels of more than 20 ft. draught may be found some 600 yd. or so out, in the same vicinity. Landing is not difficult in calm weather near the western point.

Water is available on the island, from several brackish wells, and from cisterns. The western curve of the land rim is occupied by a coconut plantation, and most of the rest of the rim is covered by patches of scrub forest, 10–20 ft. high, similar in type to that found on Sydney but less dense. At the extreme eastern point of the island the land rim is very narrow, and is bare. It appears that the island is subject to drought. Fauna consists of about seventeen species of sea birds and migratory birds, and pigs, dogs, cats, poultry and other domestic animals. Lizards, Polynesian rats, crabs, and about fifty kinds of insects also are found there. Turtles come ashore to lay their eggs, and fish are abundant in the lagoon and off the reef.

The ruins of an ancient stone shrine or small temple at the eastern point, and a hundred or more graves and remnants of stone platforms on the north side show that the island was inhabited at one time by Polynesians. Hull is sometimes claimed as a discovery of Wilkes, leader of the United States Exploring Expedition, who visited and named it in 1840. But since he found there a Frenchman and some Tahitians it was clearly known to Europeans before then, and it was almost certainly known to the whalers. In 1887 Hull was occupied by Mr A. F., now Sir Albert, Ellis and his brother on behalf of J. T. Arundel's firm; they found insignificant phosphate deposits, but planted some 20,000 coconuts on the western side, clearing and burning areas of *Pisonia* forest to do so. The coconut plantation thus formed has remained in being since then. The history of the plantation is similar to that on Sydney (p. 499). By 1938 it was estimated that the planted area had been increased from 250 acres in 1926 to 400 acres. Under the settlement scheme of the Gilbert and Ellice Islands Colony government 10 Gilbert islanders were landed in December, 1938, followed by a further 75 in April 1939 and 222 more later, making a total of 307 in 1940. Owing to the planted area having proved to be unexpectedly extensive and fertile, it was then thought that the island would accommodate a further 200 settlers without additional planting; and that eventually it would support 1,100 people in all. As on Sydney, a village, schools, churches, a hospital, water supplies and a co-operative society have been established.

Hull was formally placed under British protection in 1889 by Commander Oldham of H.M.S. *Egeria*, and together with the rest of the Phoenix group was included within the boundaries of the Gilbert and Ellice Islands Colony in 1937. Since August of that year a resident European Acting Administrative Officer has been established on the island.

Sea communication is maintained with the Gilbert and Ellice Islands Colony several times a year. In August 1937 a government W/T station was set up, and it has maintained a daily schedule with Canton and with Ocean island. Hull would provide good anchorage for seaplanes and flying boats, with sufficient runways in the lagoon, but its lack of a good entrance, even for boats, renders it inferior to Canton. There is no air service.

Gardner Island

Gardner island (lat 4° 40′ S, long. 174° 32′ W) is the south-western island of the Phoenix group. It is a long wedge-shaped atoll, with the point curving towards the south-east, about 3¾ miles long by about 1 mile in greatest width. In most parts the narrow land rim is less than ¼ mile wide (Fig. 155).

Anchorage may be found on the north-west side, in 9 fathoms, but is safe only with the prevailing south-easterly trade wind. Landing over the reef can be made here, but it is difficult. The land rim is broken on the west and in the middle of the south side by two narrow entrances, but both are blocked on the ocean side by the narrow fringing reef, 100–300 yd. wide, which surrounds the island. Hence neither passage is navigable, even for boats. The lagoon is shallow but remarkably free from coral patches.

As on Sydney and Hull, the soil on Gardner is of somewhat better quality, with more humus, than on the northern Phoenix islands, and consequently supports a moderately heavy vegetation. Well water is brackish, but drinkable from wells in the north.

Most of the land rim is covered in a low scrub forest, in which the most conspicuous trees are *Pisonia*, *Cordia* and scattered *Tournefortia*. The trees are highest at the north-western end, some being as much as 90 ft. high. Groves of coconut palms have been planted on either side of the western entrance to the lagoon. Sea birds are plentiful on the island, and fish are abundant in the lagoon and on the reef. The large coconut crab is so numerous that the island was called *Motu Unga* (island of coconut crabs) by some Niue workmen at one time.

The discovery of Gardner is commonly credited to Captain Joshua Coffin, of the *Ganges* of Nantucket, at a date variously given, but which may possibly have been 1828. The island was visited by Commander Wilkes in 1840 and its position fixed. No phosphate was ever extracted from the island, but coconuts were planted there about 1890 as part of the activities under the control of J. T. Arundel. In 1892 there were twenty Niue labourers there engaged in clearing and planting. In this year a declaration of British protection over the island was made by Captain Gibson of H.M.S. *Curaçoa*. (H.M.S. *Egeria* on her visit to the Phoenix group in 1889 did not call at Gardner since her instructions covered only islands considered in connexion with the proposed trans-Pacific cable.)

The coconut plantation on Gardner was not a success, and by 1937, when the island was investigated in connexion with the proposed settlement scheme from the Gilbert and Ellice colony, there were only 111 palms in bearing. Nominally the plantation had the same history as those of Sydney and Hull, but in fact nothing was done to develop it. In December 1938 a party of ten natives from the Gilbert islands was landed there and dug wells, cleared a village site and built houses. By additions in 1939 the settlement was brought up to fifty-eight people, in sixteen families. It was estimated in 1940 that it would take seven years for the coconut palms then being planted to come into bearing, and after that the population could be gradually increased to a maximum figure of 1,000.

Communication is probably irregular, and dependent on the calls of vessels at Sydney and Hull. There is no W/T station.

McKean Island

McKean island (lat. 3° 35′ S, long. 174° 04′ W) lies 70 miles north-north-east of Gardner, and is the north-western island of the Phoenix group. (It was reported in 1933 to lie about 8 miles west-north-west of its charted position.) It is of oval shape, about 1,000 yd. long by ½ mile wide, and is of coral and sand formation. The greatest height is about 17 ft. at the beach crest on the north.

The central portion of the island is an irregular depression, which has been increased by phosphate digging, so that like Phoenix it resembles an empty plate. Part of the depression is occupied by a salty lagoon, variable in size with the tide, though it has no obvious connexion with the sea. A fringing reef borders the island, 100–200 yd. wide, being narrowest on the western side. Anchorage is said to be good on this side, so that vessels loading phosphate in the nineteenth century did not require the buoys and cables necessary at most of the other islands in the area. Landing is comparatively easy near the middle of the western side, just south of the western point; it is best just after high tide.

The vegetation consists of low herbs such as *Portulaca*, *Sesuvium* and *Lepturus* bunch-grass. There are no trees. Bird life is abundant, with terns as the predominant type. The usual crabs and insects are common. Fishing in the deep water off the reef is said to be excellent, tuna and barracouda being among the large types taken. The island appears to have no supplies of fresh water.

McKean is generally considered to have been a discovery of Captain Wilkes, in 1840, but it was probably sighted by whalers before that date, and an unnamed island in lat. 3° 32′ S, long. 173° 44′ W, probably one of the discoveries of Captain Emment, may well have been this. The phosphate deposits, which were then very valuable, were worked by the Phoenix Guano Company between 1859 and 1870, with Hawaiian labourers. The island was not re-worked, as some others of the group were, by J. T. Arundel. It was included within the boundaries of the Gilbert and Ellice colony in 1937, and was declared a bird sanctuary in June 1938. It was surveyed by U.S.S. *Bushnell* in 1939. Though investigated in connexion with the Gilbert and Ellice colony settlement scheme, it was regarded as of value only as tributary to the main islands, and possibly able to support up to 3,000 coconut palms when fully planted. It is uninhabited.

BIBLIOGRAPHICAL NOTE

Most of the source material for the central equatorial islands is contained in small articles scattered through a variety of periodicals. But a valuable comprehensive account, with very full bibliography, is given by E. H. Bryan Jr., *American Polynesia* (Honolulu, 1941). This also discusses the Tokelau and Northern Cook islands. General information is also given in the *Pacific Islands Pilot*, vol. II (1932), vol. III (1931); U.S. Hydrographic Office *Sailing Directions for the Pacific Islands*, vol. II (1940)—with supplements in each case; Foreign Office *Peace Handbooks*, vol. XXII, No. 144 (London, 1920); *Pacific Islands Year-Book* (Sydney, 1939). In the preparation of this chapter unpublished material from official sources has also been used. For maps see Appendix I.

The following list gives some of the most useful references. A number of the early contributions are still valuable because their authors lived on the islands for longer periods than have many of the later writers:

Physical Geography, etc.

C. K. Wentworth, 'Geology of the equatorial islands', *Bernice P. Bishop Museum Occasional Papers*, vol. LX, No. 15 (Honolulu, 1931); C. K. Wentworth and H. S. Ladd, 'Pacific island sediments', *University of Iowa Studies, Studies in Natural History*, vol. XIII, No. 2 (Iowa City, 1931); H. H. Clayton, 'World weather records', *Smithsonian Miscellaneous Collections*, vol. LXXIX (Malden island), pp. 122–3, 1159–61 (Washington, 1937); W. A. Dixon, 'Notes on the meteorology and natural history of a guano island' (Malden island), *Journal and Proceedings of the Royal Society of New South Wales*, vol. XI, pp. 165–75 (Sydney, 1877); E. Christophersen, 'Vegetation of Pacific equatorial islands', *Bernice P. Bishop Museum Bulletin*, No. 44 (Honolulu, 1927)—deals with the northern islands; A. J. Campbell, 'Notes from Malden island', *Victorian Naturalist*, vol. VI, No. 8, pp. 123–6 (Melbourne, Dec. 1889); J. J. Lister, 'Notes on the birds of the Phoenix islands (Pacific Ocean)', *Proceedings of the Zoological Society of London for* 1891, pp. 289–300 (London, 1891); T. H. Streets, 'Some account of the natural history of the Fanning group of islands', *The American Naturalist*, vol. X, No. 2, pp. 67–72 (Boston, 1877); E. Rougier, *Ile Christmas* (Brioude, 1914); E. Rougier, 'Ile de Christmas', *Bulletin de la Société d'Etudes Océaniennes*, No. 1, pp. 25–30 (Papeete, 1917); E. Rougier, 'L'Eau potable dans les Atolls', *Bulletin de la Société d'Etudes Océaniennes*, No. 6, pp. 29–32 (Papeete, 1922); J. F. Rock, 'Palmyra island with a description of its flora', *College of Hawaii, Bulletin*, No. 4 (Honolulu, 1916).

Phosphate

J. D. Hague, 'On phosphatic guano islands of the Pacific Ocean', *The American Journal of Science and Arts*, 2nd series, vol. XXXIV, pp. 224–43 (New Haven, 1862); W. A. Dixon, 'The guano and other phosphatic deposits occurring on Malden island', *Journal and Proceedings of the Royal Society of New South Wales*, vol. XI, pp. 176–81 (Sydney, 1877); K. Elschner, *Corallogene-Phosphat Inseln Austral Oceaniens und Ihre Produkte* (Lübeck, 1913); A. F. Ellis, *Adventuring in Coral Seas* (2nd ed., Sydney, 1937).

History and Political Conditions

K. P. Emory, 'Archaeology of the equatorial islands', *Bernice P. Bishop Museum Bulletin*, No. 123 (Honolulu, 1934)—for pre-European history and other data; E. Behm, 'Das Amerikanisches Polynesien...', *Petermann's Mitteilungen*, pp. 173–94 (Gotha, 1859); S. W. Boggs, 'American contributions to geographical knowledge of the central Pacific', *The Geographical Review*, vol. XXVIII, pp. 177–92 (New York, 1938).

General Accounts of Recent Expeditions

H. E. Gregory, 'Report of the Director for 1924', *Bernice P. Bishop Museum Bulletin*, No. 21 (Honolulu, 1925); I. C. Gardner, 'Crusoes of Canton island', *National Geographic Magazine*, vol. LXXIII, pp. 749–66 (Washington, Jan.–June 1938); L. P. Schultz, 'The Navy Surveying Expedition to the Phoenix and Samoan islands, 1939', *Explorations and Field-Work of the Smithsonian Institution in* 1939, pp. 45–50 (Washington, 1940).

Many small articles of current interest are contained in the *Pacific Islands Monthly* (Sydney) from 1935 onwards, and in *Paradise of the Pacific* (Honolulu) from 1937 onwards.

Chapter XII

THE TOKELAU GROUP, THE COOK ISLANDS AND NIUE

The Tokelau Group: Swains Island: General Review of the Cook Islands: The Lower Cook Group: The Northern Cook Group: Niue: Bibliographical Note

The islands described in this chapter, with the exception of Swains island, are all dependencies of New Zealand and are conveniently considered together. But they fall into two fairly clearly marked types. The Tokelau group, Swains island and the Northern Cook group, in the vicinity of lat. 10° S, are low coral islands, all but one being atolls. In their comparative poverty of water supplies, soil fertility and vegetation they resemble to a modified degree the central equatorial islands described in the last chapter. Some of them also were bonded under the American Guano Act of 1856, though none were actually worked for phosphate. The Lower Cook group and Niue, in the vicinity of lat. 20° S, are nearly all high volcanic islands without interior lagoons. Most of them are fertile, with good water supplies and luxuriant vegetation of many types. They therefore support larger populations, have a more diversified economic life, and are of greater commercial and political importance.

THE TOKELAU GROUP

The Tokelau islands lie due north of Samoa and east of the Ellice islands, on a general north-west and south-east line, between lat. 8 and 10° S, and long. 171 and 173° W. They comprise three atolls, Atafu, Nukunono and Fakaofu, with a total land area of about 2,550 acres. The group is a British possession, administered as a dependency of New Zealand. It was formerly known as the Union group; Fakaofu has also been known as Fakaofo. (Swains island, a United States possession, may be linked geographically with this group.)

Physical Geography

Each atoll is of irregular shape, composed of a cluster of islets emerging from coral reefs enclosing a spacious lagoon. The majority of the land surface in each case is on the eastern side of the atoll, in

the form of narrow curved stretches of sand and coral, varying from 100 yd. to 3 miles long, but fairly uniform in width, from about 100 to 400 yd. The islets are all low, varying between about 8 and 15 ft. above sea level, and many of the connecting reefs are bare at low tide. The surface structure is entirely of coral formation (Fig. 156).

There are no marked coastal features, and there is no access for vessels into any of the lagoons, nor are there even any good boat

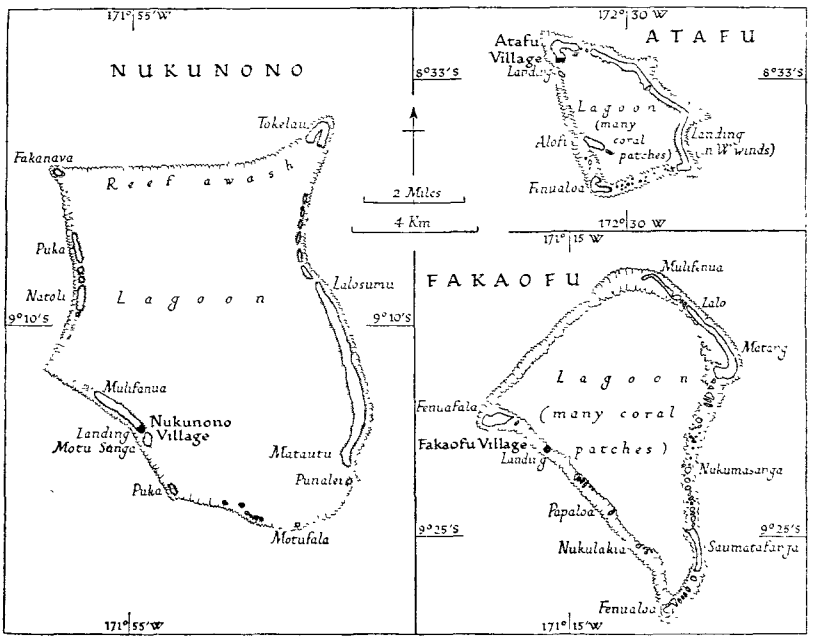


Fig. 156. The Tokelau group

Based on: (1) Admiralty chart no. 765; (2) other official sources; (3) G. Macgregor, *Bernice P. Bishop Museum Bulletin*, no. 146, pp. 5–10 (Honolulu, 1937); E. H. Bryan Jr., *American Polynesia*, pp. 84–95 (Honolulu, 1941). More complete survey may show some variation in the shape and size of islets from the plan given here.

passages. The reef extends only a short distance from the shore, and then descends steeply into very deep water. Anchorage is available only at Atafu. Landing is made in canoes and small boats.

The islands are cooled by the east-south-easterly trade winds for more than half the year, from about April till November, and are consequently comfortable for living in spite of their nearness to the equator. Because of the prevailing wind, the villages are all built on the westerly islets of the atolls. In the other months of the year, the

'summer', variable winds (mostly easterly) and calms occur, and the heat is considerable. Temperatures show little diurnal range and probably average about 82° F. throughout the year. There are occasional hurricanes. In January 1914 at Atafu the church and most of the houses were demolished and many coconut palms were levelled to the ground.

The ocean currents in the vicinity of the islands change with the seasonal winds. During the trade-wind season the set of the current is from east to west, with a considerable drift. At other times the current from the north runs parallel to the general north-west and south-east line of the group, and finally sets to the east and north-east.

Rainfall occurs mainly as daily showers in the trade-wind season. From the end of November to the end of February it is usually slighter, and periods of drought often set in, but there are occasional torrential downpours. The record of rainfall for nine months (October to July) in one year was 134 in.; most of this fell towards the end of the period. Before modern storage facilities were available the natives conserved rain water by hollowing out the lower part of the trunks of coconut palms to catch the water as it streamed down. Nowadays several wells and cisterns allow a more permanent supply to be held.

The soil of the islets is composed mainly of coral sand, with only a small amount of organic matter, and is much intermixed with coral debris. Its loose composition makes for very rapid drainage, and tends to inhibit the accumulation of humus, with the result that its fertility is low, except in specially prepared gardens.

The flora in consequence has little variety, and the range of cultivated plants is very small. The vegetation of the atolls comprises only about forty species altogether, and of these a number have been introduced, either by natives or Europeans. Coconut and pandanus are among the commonest types. Other species of trees and shrubs well known in central Polynesia include *Cordia subcordata*, *Thespesia populnea*, *Morinda citrifolia*, *Solanum viride*, *Ficus tinctoria*, *Scaevola frutescens*, *Hernandia ovigera*, and *Gardenia taitensis*. Economic use is made of the products of most of these, such as the timber of *Cordia* and *Hernandia*, the bark of *Cordia*, the fruits of *Morinda* and *Ficus*, and the flowers of *Gardenia*. Cultivated plants include banana, papaya, a coarse variety of taro and (on Fakaofu) three varieties of breadfruit. Polynesian arrowroot (*Tacca pinnatifida*) grows well on Atafu, but is not much used for food.

The fauna of the group includes domestic pigs, poultry and cats; rats; lizards; and birds, mainly sea birds. The long-tailed cuckoo and some other species of migrant birds call there. Insects are fairly common, and there are mosquitoes, especially on the uninhabited islets, where undergrowth is thickest.

History

The history of the group before European contact is obscure, but native tradition speaks of early settlers from Samoa and Rarotonga as the ancestors of the people of Fakaofu. Towards the end of the seventeenth century warfare between the inhabitants of the three islands was common, ending in the dominance of Nukunono by Fakaofu, and also in the conquest of Atafu and Olosenga (Swains island) and recolonization from the same source. The great Fakaofu war leader was Te Vaka, a man of high rank. Contacts with other Polynesian islands were frequent. Fiji, Tonga, Samoa, Uvea, Futuna, Pukapuka and other islands were known to the Tokelau people through drift voyages or war expeditions.

Though Swains island was discovered by Quiros in 1606, European knowledge of the Tokelau group began only when Commodore Byron discovered Atafu in 1765, and named it Duke of York island. In 1791 Captain Edwards, knowing of Byron's visit, came there in H.M.S. *Pandora* in search of mutineers from the *Bounty* and went on to discover Nukunono, which he named Duke of Clarence island. In 1841 Captain Morvan of the *Adolphe* discovered Fakaofu which shortly afterwards was found independently by vessels of the United States Exploring Expedition, and named Bowditch. Since the latter half of the nineteenth century the atolls have been in frequent contact with the outside world through the visits of missionaries and traders. On several occasions about the middle of the century the population suffered heavily through the raids of South American vessels engaged in kidnapping labour for mines and plantations.

Mission contact with the group began with a Roman Catholic visit to Fakaofu in 1852, to bring relief after a hurricane, but the first response was discouraging. The Protestant mission vessel *John Williams*, calling there in 1858, also met with no success, but found the people of Atafu receptive. Subsequent effort by both missions induced the natives of the other atolls to accept Christianity. The people of Atafu are Protestants and those of Nukunono are Catholics, but Fakaofu has members of both churches. At Fakaofu there have

twice been fights between the two religious groups; in one of these, about 1880, the high chief was killed.

In 1889 the Tokelau islands were visited by Commander Oldham in H.M.S. *Egeria* and officially declared to be a protectorate of Great Britain. In 1916, the group, called officially the Union islands, was incorporated into the Gilbert and Ellice Islands Colony. But in 1925, as it was considered that it would be more conveniently administered from Western Samoa, it was transferred to the jurisdiction of New Zealand. From 11 February 1926 it was placed under the administration of Western Samoa. This measure was most acceptable to the natives, who felt that they had bonds of kinship with the Samoans, and regarded that territory with affection as the source of their missionaries. At the same time Swains island (Olosenga) was placed under the jurisdiction of American Samoa.

The People

The people of the Tokelau group are Polynesian in physical appearance, language and culture. They show strong affinities with Samoans, from whom much of their culture appears to have been derived, and with the people of the Northern Cook islands, as well as with those of Funafuti and of Vaitupu in the Ellice group.

According to the latest official figures available, the population in 1936 was 1,170 for the three atolls, being distributed as follows: Fakaofu, 508 people; Atafu, 378; Nukunono, 284. This represents a total increase of 137 people from 1926, shared by all the atolls, but greatest in proportion on Nukunono, where land is most plentiful owing to the heavy depletion of the population by the South American labour raiders. The population is entirely native, with a small intermixture of white blood from early traders.

Little detailed study has been made of their physical characteristics, but in general they are tall, well built, with broad chests and long arms, light brown skin and dark wavy or straight hair. The face is somewhat broad and flat, and nose and lips are fairly thick. The skull is brachycephalic.

The Tokelau dialect contains more consonantal sounds than any other Polynesian dialect, using *h* and *s* interchangeably, and formerly *wh* and *w* as well as *f* and *v*, where other dialects normally use only one of each of these pairs of sounds. The closest parallels of Tokelau speech are with that of Manihiki in the Cook islands on the one hand and with that of Vaitupu in the Ellice islands on the other. Phonetic-

ally the dialect of Samoa, geographically the nearest, is more divergent from that of Tokelau, though the modern Tokelau speech, especially in its written form, has been influenced by Samoan through the missions, and in vocabulary the Tokelau dialect resembles that of Samoa very closely.

Culture

The culture of the Tokelau people, practically uniform in all three atolls, is evidently of composite origin, showing elements in common with both eastern and western Polynesia. On each atoll the population is concentrated in a single village.

Domestic Life. The common dwelling houses are rectangular in shape, 25–30 ft. long, 12–15 ft. wide and about 15 ft. high, with the framework supported by four corner posts. A foundation of coral a foot or so above ground level is retained by coral slabs or coconut logs, and the floor is of white beach coral pebbles. The roof is thatched with sheets of pandanus leaf or coconut frond, and the walls are usually of the same material. The ancient houses were without walls, and the roof came down to 2 or 3 ft. above the ground. Nowadays there is much variety in dwellings owing to introduction of house types from other parts of Oceania, such as the Gilbert and Ellice islands, and to innovations inspired by European houses, such as windows and doors. There are also larger houses used as assembly halls and lightly built storage houses for copra or for oven shelters. In former times there were also canoe sheds, large dwellings for chiefs, and temples for the gods.

House furnishings are simple, and though the pandanus mats formerly used as bedding are tending to be replaced by European cloth, pillows are still made from a solid block of wood. All cooking is done in small kitchens near the dwelling houses. Pit ovens are dug in the floor and lined with coral pebbles, which must be renewed after each baking. Fire is obtained from two sticks by the plough method when a brand cannot be borrowed. Dishes consist of wooden bowls, coconut shells and coconut-leaf platters.

In former times a man's clothing consisted of a breech-cloth plaited from strips of *Cordia* bark or pandanus leaf, and a woman's clothing of a thick kilt like a bundle of straw, of strips of bark or coconut frond. Nowadays these have been replaced by loin cloths and other garments of European cotton cloth, which is more durable, needs less trouble to prepare, and has missionary approval.

Social Organization. In the social organization the two units of primary importance are the individual family and the larger kinship group including all persons tracing descent in the male line from a common ancestor. Marriage is frequently matrilocal at first, the husband living in the household of his wife's family and working and fishing with her kinsfolk. But he participates in the social activities of his father's kin group, being subject to the authority of its head, and deriving his landed property from it. When children are born the final residence varies, depending on the number of people in the family of husband and wife and the wealth in land of their respective kin groups. Polygyny was formerly practised to some extent, but the difficulty of supplying food for more than one household was a restraining factor. Sex relations among the unmarried were fairly free, but adultery of a married woman was regarded as one of the most serious crimes, and was punished by destruction of the property of her kinsfolk. The abolition of this custom in modern times has resulted in much greater sexual laxity.

In former times each village had large houses where the men gathered in leisure times and the unmarried men and older boys slept. On Fakaofu there were seven, on Nukunono five, and on Atafu three such houses, and membership was probably originally based on kinship. Nowadays on each atoll these have been replaced by one council house which may serve also as a communal meeting place.

Rank and authority are well developed in Tokelau society, and are organized primarily on the basis of membership of the large kinship groups. Each of these is directed by the eldest living male member, who superintends the social affairs of the group and in particular supervises its landed property. Formerly each head of a group received a hereditary title, as in Samoa, but with the modern tendency towards greater independence of small households and private ownership of land these titles have been dropped. Each island had formerly a chief and a council, membership of the latter being drawn from heads of the kinship groups, with the approval of the chief. The chief himself belonged to one of the few kinship groups entitled to provide rulers, and succession theoretically passed from father to eldest son, though in some cases precedence was given to a younger brother of a deceased chief in virtue of his age. The appointment was decided by election in the village council. On Fakaofu members of four kinship groups were eligible candidates, all being descended from two brothers who according to tradition were the first dis-

coverers and owners of the atoll. In historic times one of these kinship groups also provided the chiefly lines of Nukunono and of Atafu, by virtue of conquest. For this reason the chief of Fakaofu was the supreme authority for the three atolls, maintaining his rule by the belief in his power of cursing anyone to death, and by his function as priest to the supreme deity of the people, to whom he was thus believed to bring food, rain and calm weather. This high chief was a sacred person whose body could not be touched by others, who had great economic and social privileges, and whose death was followed by elaborate religious rites. The high chieftainship and other native offices were abolished in 1916 and replaced by appointments representative of the administration.

Land Tenure. Rights to land, which is the main wealth of the Tokelau people, are based on membership of the kinship groups, so that every person is forced to know his genealogy accurately. The land of each atoll has been completely divided, with the exception of small portions retained as communal lands to grow a reserve food supply or to provide timber and coconut or pandanus leaves for communal enterprises. The major sections of the land are held by kinship groups, and are subdivided into individual holdings of plantation land and village land for houses and sheds. The boundaries of plantation land extend into the water to the edge of the reef, and fishing rights there belong to the landowner, though the fishing is not withheld from others. The landowner has the right of taking coconuts, pandanus fruit and leaves and most kinds of timber from his plantation. But a strict rule forbids the cutting of any *Cordia* trees—important especially for canoe timber—without the consent of the head of his kinship group. Moreover, plantation lands are still set aside in rotation for the production of copra under an old system of taboo used as a check upon theft and for conservation of food supplies.

There is some variation in the inheritance of land. Normally the control of a man's land goes to his eldest son, who divides it among his brothers and sisters. But brothers who have the use of sufficient land from their wives often do not receive an actual portion of land, but only a share in the food that is gathered from it, and a share of the money from the sale of copra produced there. Many landowners have left complete control of their land to the eldest daughter, and the sons have only a share in the product. In some families all the children inherit alike; in others the eldest son and daughter receive larger shares than the younger children. When a person dies without

children the land reverts to his kin group, and is reallotted by the senior members. The village councillors decide who shall receive the land in cases of disputed inheritance.

At Fakaofu and to a lesser extent at Atafu there is pressure of population on the land, but on Nukunono land is still plentiful. Part of Nukunono was once owned by people of Fakaofu, but when the islands were included in the Gilbert and Ellice Islands Colony this land was returned, and paid for in copra.

Food Production. Owing to the poor quality of the soil, agriculture in the Tokelau group is little developed. Coconut and pandanus fruit, the staple vegetable foods, require a minimum of cultivation. A coarse variety of taro is grown in garden beds fertilized with leaf mould, as the result of European influence, and forms part of the daily food supply. Bananas and papaya are grown in the same way, but their fruit is small.

The lack of agricultural resources forces the people to depend largely upon fishing for a livelihood. Fish are abundant and the men are expert in taking them. Seine netting and angling are the principal methods followed, though catching squid with a lure, noosing king-fish and shark, and taking flying-fish with torch and a long-handled dip-net at night are also popular. Trolling for bonito is the greatest sport of Tokelau men, and demands considerable skill. Formerly there was much ritual attached to the sport, and prayers for success are still said nowadays by the fleet of canoes when they have passed the reef. When the bonito are running well a communal fishing expedition may be held, and the canoe with the highest catch has the privilege of leading the rest back to the village. The total catch is divided on the village square, and a feast is held.

Canoes. The canoe is the most valuable piece of movable property of a Tokelau islander, being essential for procuring fish or for transporting food from the plantation across the lagoon. In former times double canoes were used for long inter-island journeys, but the government prohibited their use because of the loss of life so caused. The present-day canoes are all of the single-outrigger type. They usually have a hull made of three sections of tree-trunks, built up further by additional planks of irregular shape, and protected by bow and stern covers. Joints are made in all cases by boring and lashing with eight-ply coconut sennit. There are ordinarily five outrigger booms, connected to the float indirectly by stakes. The normal crew is five men. The canoe is sailed, the sail being of narrow triangular shape with the apex of the triangle pointing forwards and

downwards to the bow cover, where yard and boom meet. But since in sailing the Tokelau seamen always keep the outrigger to windward as a balance, the craft is not put about in tacking. The tack of the sail is shipped aft, and the stern of the canoe serves as the bow on the new tack. The craft is steered with a short-handled broad-bladed oar.

The canoe hulls are built of *kanava* (*Cordia subcordata*), a durable timber, resistant to water, but heavy and hard, making construction and handling difficult. Owing to its stumpy form, with quick taper from a broad base, only the lower part of the trunk can be used, necessitating the sectional construction of the hull. The outrigger floats are made from the light straight-grained but less durable *puka* (*Hernandia ovigera*). Scarcity of good canoe timber has led to its rigid control. In former times canoe-shaping and other woodwork was done with adze blades made from the shell of the giant clam, there being no stone on the atolls suitable for tools. A few basalt blades brought from Samoa were highly prized. Steel tools are now used.

Religion. The religion of the Tokelau people in former times had much in common with that of other Polynesian communities of the western area. The supreme deity Tui Tokelau, possibly a deified chief, was believed to control all nature, including the food supplies of the three atolls. He was propitiated each year with offerings to make fish and coconuts plentiful and to send sufficient rain. Other gods were mainly personifications of natural elements, while ancestral spirits were regarded as helping their descendants in sickness or trouble. No stone platforms were erected to the gods, as was common in eastern Polynesia, but they were represented by large coral slabs, and worshipped in temples. Priests and spirit mediums acted as intermediaries between the gods with the people.

The London Missionary Society has now a station with a native teacher on Atafu, and a Roman Catholic mission is similarly established on Nukunono, while Fakaofu is shared between both. In all cases the teachers and their wives play a prominent part in the social life of the community and have influenced the native life considerably. On Atafu, for example, the older boys of the school sleep in a house built by the mission teacher; this has largely supplemented the former men's house. Throughout the group dancing was abandoned for many years owing to mission disapproval.

Administration

Since 1926 the Tokelau islands have been controlled by the Administrator of Western Samoa on behalf of the New Zealand government. The Secretary of Native Affairs in Western Samoa is the District Officer for the Tokelau group, which has no local European officials. On each atoll administration is carried on by a small number of native officials, appointed and paid by the government. Chief of them is the *faipule* (a title derived from Samoa and meaning 'Adviser').

The *faipule* attends the Council of Advisers in Western Samoa when ordered by the Administrator, and advises the latter on native affairs; presides at all meetings of the village committee on his atoll; administers the native laws and regulations; supervises the police; and acts as local magistrate. The mayor of the village (*pulenu'u*) acts as an assistant to the *faipule* and substitutes for him on occasion; allocates the work to be done in the village and plantations; supervises the making of copra; and sees that canoes, boats and water catchment areas are in good order. A clerk (*failautusi*) keeps the government records and is in charge of public money. There is also a chief of police.

Each village has a village committee or native council, composed of elderly men who are recognized leaders; this determines all matters of village policy and welfare. A women's committee looks after the sanitation of the houses and the health and welfare of the children.

The laws in force in the Tokelau group are, generally speaking, the same as those of Western Samoa, though modified to some extent in practice to suit local conditions. The *faipule* of each island acts as magistrate for ordinary cases, but annually a member of the office of Native Affairs from Western Samoa pays a visit to settle any local difficulties.

No detailed figures of the budget are available for recent years, but annual receipts and expenditure each amount to somewhere in the region of £1,000, with usually a small credit balance. Receipts are derived primarily from import duties and from an export duty of £1 per ton on copra. The salaries of the native officials are small, and the larger part of the expenditure is on health, education and the provision of better water supplies.

Social Services

Education in the group is undertaken by the missions, which maintain village schools under native pastors. Practically all the people are literate, mainly in the Samoan language.

A recent picture of health conditions in the group is not available. Tuberculosis, yaws and skin diseases, especially the so-called 'Tokelau ringworm', were common twenty years ago, but have been reduced in the interval by government action. Leprosy is absent, and also elephantiasis, though filarial infection was at one time found in about one-third of the cases examined. The filarial incidence, however, is much lower than in the Ellice islands, since the village islets are so small and so occupied that little superfluous bush cover is available for the carrier mosquito.

A trained native medical practitioner is the health officer for the three atolls, and each village has a native nurse and a dresser. At Atafu there is a hospital to which the serious cases of sickness are sent from all the islands, and a European medical officer from Western Samoa visits the group annually.

Economics

The economic resources of the group, apart from local foodstuffs, consist entirely of coconuts which are prepared as copra. Much of this is produced under the control of the kinship groups and the native officials. The palms are mostly old, and the yield is considerably less than that obtained in Samoa. In 1926 it was estimated that the amount of copra available for export on the average was 65 tons from Atafu, 90 tons from Fakaofu, and 210 tons from Nukunono. With the increases in consumption of coconuts due to growth of the population, however, it is possible that these amounts have now been reduced. The fisheries, though of basic importance to the people as a source of food, are of no commercial importance.

The tendency to pressure of population on the land at Atafu and Fakaofu has stimulated the temporary migration of some of the men abroad as labourers to Swains island, the Phoenix group and Samoa.

Commerce is naturally small, consisting in the export of copra and of some native craft objects, as fans of coconut leaf trimmed with feathers, and small cylindrical wooden boxes made originally to hold fishing gear. Clothing, cloth, hats, dyes, cotton fishing line, steel tools and a few other European types of goods are imported. That the accumulation of some surplus in cash is possible, however, is shown by a contribution of £100 towards the cost of the present war by the people of Fakaofu—a level of nearly 4*s.* per head, which is a considerable achievement by native standards of income.

Communications

Sea communications with the outside world are provided by trading schooners and a steam vessel, which call from Samoa at irregular intervals several times a year. Inter-island travel must now be made by the same means. Within each atoll canoes and boats are used, there being in 1926 about thirty canoes on Atafu, the same number on Fakaofu, and about twenty on Nukunono, with about half a dozen small whaleboats in addition. Apia in Western Samoa has been the port of entry for the group since 1923. Rail and road communications do not exist on the islands, though broad paths with low slab curbings are laid out through the villages.

There are no ordinary telegraph or telephone services. A W/T station communicating daily with Apia is operated on Fakaofu by a Tokelau native for the government.

Fakaofu

Fakaofu atoll (lat. 9° 23′ S, long. 171° 15′ W) is composed of about sixty islets which form a triangle 7½ miles long and 5½ miles wide around the lagoon. The islets are connected by a reef which is awash at high tide, and their average elevation is 10 ft., the highest points being on the north and the south islets. The most continuous land is on the north-east side. The total land area is about 650 acres.

There is no anchorage, and no boat passage into the lagoon, though canoes cross the reef at a point near the village, which is on the islet Fakaofu on the western side. Water on the islet is provided by several wells, and by a modern cistern of 11,000 gallons capacity, filled from the roof catchment of the church.

Partly for protection against Peruvian slave raiders in the middle of the last century, but also for easy landing and for water supplies, the population has confined itself to the one islet. This has been possible only by extending the islet floor over the lagoon. Walls of coral blocks originally built to protect the houses from high waves have been pushed out as population increased, and the area behind them has been filled in with loose coral and rubbish. On the sea front walls have also been built up, though they do not extend beyond the original shoreline; the end of one wall has been pushed out to serve as a landing for small boats (Fig. 157).

Nukunono

Nukunono atoll, with a position given as lat. 9° 12′ S, long. 171° 55′ W, is said to lie about 3½ miles to the eastward of its charted position. It is composed of about twenty-four islets, the largest of which lies on the eastern side. Nukunono, the islet from which the atoll takes its name, is on the south-west. The northern reef is bare and awash. The total land area is about 1,350 acres.

There is no anchorage or boat passage through the reef; a former passage was filled in during a hurricane. At the south-eastern end of Nukunono islet proper, however, the reef is protected and may be crossed with little danger. The water supply consists of one poor well; two concrete cisterns, one of about 8,000 and the other of 5,000 gal. capacity; and several small tanks.

The lagoon has possibilities as a flying boat anchorage, and is conveniently situated in regard to the air route from Honolulu to Suva.

ATAFU

Atafu atoll (lat. 8° 32′ S, long. 172° 31′ W) is composed of about forty-two islets. It is the smallest island in the group, extending about 3 miles north and south and 2½ miles east and west, with a total land area of about 550 acres. The highest land has an elevation of about 15 ft. The longest stretch of land occupies the eastern side of the atoll. It has no single name but is divided by the people into about thirty sections, each of which has a name of its own. The village is on the northern islet of the atoll.

The reef is awash at low tide and it is possible to walk from one islet to another. There is anchorage in offshore winds off the north-west end of the atoll, in 10

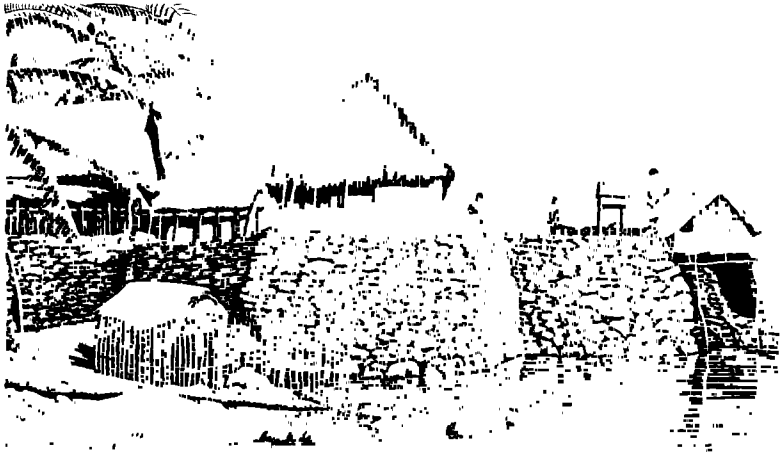


Fig. 157. Part of the sea front of Fakaofu village

A stone-walled platform has been extended as a jetty, and the end (on the right) has been adapted as a landing for small boats. On the platform are dwellings; the small building on piles over the sea is a latrine, of a common Oceanic type. Based on a photograph by G. Macgregor, *Bernice P. Bishop Museum Bulletin*, no. 146, Plate 10 C (Honolulu, 1937).

fathoms, but there is no boat passage into the lagoon, though with care a boat may cross the reef in places at high water. The crossing most used by canoes is at the south of the islet of Atafu proper, on which the village stands, at the northern tip of the atoll. This is one of the main outlets for the lagoon waters. During a hurricane in 1914 sand and loose coral filled in a canoe passage leading round the south of Atafu islet, adding several acres of land to the islet; then the outflow from the lagoon cut a new passage farther to the south. Water facilities are provided by several wells, some small tanks, and a concrete cistern of about 12,000 gal. capacity.

The entire village is protected from high tides and storm waves on the lagoon side by a breakwater of coral boulders, built up to a height of about 5 ft., with intervals left for canoe beaches.

SWAINS ISLAND

Swains island (lat. 11° 03′ s, long. 171° 06′ w) lies 110 miles south of Fakaofu and about 200 miles north of Samoa. Because of its comparative closeness to the Tokelau atolls, and its earlier cultural affinities with them, Swains island has sometimes been considered as part of that group, and was formerly included with them in the Gilbert and Ellice Islands Colony. In 1925, however, the island was formally annexed by the United States, and placed under the administration of American Samoa. The name used for the island by the Tokelau natives is Olosenga.

The island is an atoll about 1½ miles long and 1 mile wide, with a greatest elevation of about 20 ft. The ring of land entirely surrounds the lagoon, the water of which is not too brackish for animals to drink. The edge of the lagoon is shallow, but the depth towards the centre is about 8 fathoms. A short pier on the southern shore of the lagoon is used by boats. A fringing coral reef runs right round the island, and on its western side, where it is narrowest, a passage has been blasted out to allow whale boats to enter and load copra. There is no anchorage, but approach is best on the west side. The soil of the island is fairly fertile, and it supports much better vegetation cover and gardens than do the atolls of the Tokelau group to the north. There are many coconut palms, and along the western shore of the lagoon are deep pits bordered by mounds 8–10 ft. high, the remains of taro beds of the former population. This is in contrast with the atolls of the Tokelau group proper, where in pre-European times no taro was cultivated. Water is collected from rainfall, but there are said to be no stores of it available.

Swains island was discovered by Quiros in 1606 and named Gente Hermosa from the beauty of its inhabitants. The Spaniards found there more than a hundred people and were struck by their fair skin and golden or red hair. This has been taken as evidence for a Caucasoid element, not yet thoroughly mixed with the other components which have gone to make the Polynesian racial type. More probably, however, the light coloured hair was due to dressing it with lime to kill vermin, a practice which obtained in the neighbouring Tokelau group, and which bleaches the hair and gives it first a reddish brown and finally a golden colour. These people had a well-developed material culture, including fine mats and cord and double canoes some 60 ft. long. About the beginning of the nineteenth century a severe drought was followed by a famine, resulting in the death or migration of the entire population.

In 1841 when the island was visited by Captain Hudson of the United States Exploring Expedition it was apparently uninhabited. He named it Swains island after a whaling captain in Samoa from whom he had learned its location. Shortly afterwards parties of people from Fakaofu founded a colony there, and three Frenchmen also established a manufactory for coconut oil, exploiting the island as a plantation. In 1856 Eli Jennings, an American, married to a Samoan wife, settled on the island. Claiming title from an Englishman, Captain Turnbull, he took over the plantation and its native labourers. His descendants still own the island. The population in 1937 was about 125, comprised mostly of Polynesian labourers and their families.

The resources of the island are agricultural, and small. About 800 acres are under coconut palms, and about 200 tons of copra have usually been exported each year. Bananas, taro, breadfruit, pigs, poultry and fish are also produced in small quantity for domestic consumption.

There is one settlement, called Taulanga, on the western side of the island, near the boat passage. It includes a church, a large village meeting house, a storage shed for copra and native labourers' dwellings. The house of the Jennings family, known as Etena (Eden) or the Residency, is about ¾ mile from the settlement, on the south side of the island. It has a power-driven generator supplying electricity for lighting and for wireless broadcast reception. Primary education is provided, the pastor being also the school teacher.

Communication with the outside world is effected by schooner from American Samoa, at long intervals. A road runs almost entirely round the island, about halfway between the lagoon and the sea; a few years ago an old Ford truck collected coconuts and carried workmen and supplies. There are no signal communications.

GENERAL REVIEW OF THE COOK ISLANDS

The Cook islands, lying between lat. 8 and 23° s, and long. 156 and 167° w, are widely scattered and of small extent, the total land area being only a little over 100 sq. miles. The islands are a dependency of New Zealand. Geographically and from the administrative point of view the islands fall into two regions: the Northern Cook group,

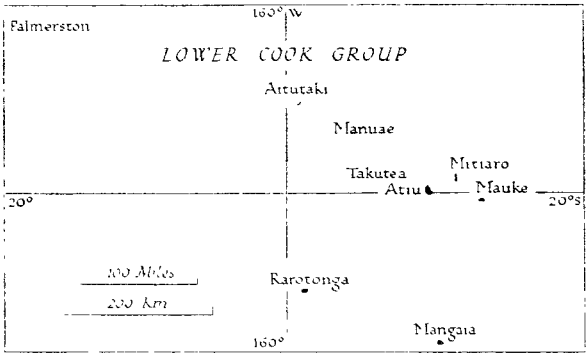


Fig. 158. Lower Cook group

Based on Admiralty chart no. 783.

comprising Tongareva, Manihiki, Rakahanga, Pukapuka, Nassau, Suvorov and Palmerston; and the Lower (southern) Cook group, comprising Rarotonga, Mangaia, Mauke, Mitiaro, Manuae, Takutea, Atiu and Aitutaki. The latter region, with Rarotonga as the administrative and commercial centre for the islands as a whole, is by far the more important (Fig. 158).

Physical Geography

In structure the Cook islands are of two main types, the characteristics of which are much the same as those of the high and the low islands already described for French Oceania (pp. 96–8). The larger islands, those of most of the Lower Cook group, are primarily of volcanic formation, and hilly or mountainous in the interior (Plates 108, 109). Rarotonga, the largest, is very rugged, and reaches a

height of over 2,000 ft. The smaller islands of the Lower Cook group and all the islands of the Northern Cook group are of coral formation and are very lowlying; most are atolls (Plate 104). All the islands are bordered by fringing coral reefs. But in addition most of the volcanic islands have an ancient elevated coral reef girdling the island immediately behind the shoreline. This tends to act as a barrier to drainage from the volcanic slopes, with the result that swamps have often formed in the volcanic alluvium on the coastal flats behind it, and many of the streams do not reach the sea. The elevated coral reef, known locally as the *makatea*, is most highly developed on Mangaia, where it stands as a solid wall of striking character (see pp. 542–4).

The actual coast of the islands is usually low, in the form of a maritime flat, though in the high islands steep slopes descending from the hills behind are probably ancient degraded sea cliffs. The beaches are commonly of coral sand or shingle, but are difficult of access from the sea owing to the fringing reef, on which there is frequently a surf breaking, especially on the eastern side, for a great part of the year.

Port facilities and anchorages throughout the islands are few. There are no good harbours for vessels of any size, though several moderately sheltered roadsteads exist. Avarua at Rarotonga is the only port at which oversea vessels have called regularly.

Climate

The major climatic variation for the Cook islands as a whole is between the trade-wind season, with predominantly south-easterly and easterly winds, lasting broadly from May to October, and the period of less steady north-easterly, northerly or north-westerly winds, lasting broadly from November to April. The Lower Cook group, being near the limit of the trade winds, is apt to have less steady south-east breezes than does the region to the north, and between November and April south-westerly and westerly winds occasionally blow as gales for several days in succession. The Northern Cook group, and to a less extent the Lower Cook group, are liable to be visited by hurricanes in the period from December to March. These tropical cyclones are often very local in their effects, but can cause great damage.

Adequate climatic records for most of the islands are lacking, but some data for Rarotonga in particular are given later (p. 537). In general, average barometric pressure for the year is low, and apart



Plate 104. Part of Tongareva, Northern Cook group

Islets on the west side, seen from outside the reef. The low flat land, set with coconut palms, is characteristic of islands in this region.



Plate 105. Coast of Niue

The island, of raised coral limestone, is almost entirely surrounded by eroded cliffs of this type.



Plate 106. Omoka village, Tongareva

Seen from the anchorage. The buildings are mostly of sawn timber, with roofs of thatch or corrugated iron.



Plate 107. Dwellings on Pukapuka, Northern Cook group

Modern houses are of various styles. Some do not have solid walls but have screens of leaf-mats instead; others have whitewashed walls of limestone.

from tropical cyclones, the variations are moderate. The mean monthly figures at Rarotonga vary between 1009 mb. in February and 1015 in August and September, the annual average pressure being 1012 mb. Temperature variations also are comparatively small. In January, February and March, the hottest months, the temperature rarely rises to 90° F. in the hottest part of the day (91 or 92° F. being a frequent absolute maximum for the period) or fall much below 65° F. at night. In the cool period, from June to September, temperatures are about ten degrees lower than these.

Rainfall is more variable. It is probably correct to say that the average annual rainfall in most of the islands is under 100 in. but there are considerable differences from year to year. Rain usually occurs in every month but the period of greatest rainfall is from about November to March, and during the middle of the year there may be drought conditions in some of the islands of the Northern Cook group. Humidity is often trying in the rainy season.

In normal times, full weather reports are sent daily from Rarotonga by W/T to Apia, as part of a scheme for the South Pacific Ocean. The water supply of the islands is usually not great; in most cases their resources are provided or supplemented by concrete storage tanks, using the corrugated iron roofs of churches and other buildings as catchment areas.

Flora and Fauna

The volcanic soils of most of the islands of the Lower Cook group are fertile and support a rich vegetation, which is particularly varied and abundant on Rarotonga. (For details of the flora of some islands see later.) Apart from the types indigenous to the area, and others introduced by the Polynesians, such as coconut, breadfruit and taro, a number of plants brought by Europeans flourish. Citrus fruits, in particular, give excellent results.

On the atolls of the Northern Cook group, however, the comparative poverty of the soil allows only of a much more restricted range of vegetation, and here the coconut and the pandanus are the most characteristic forms. On Tongareva and on Manihiki, for instance, the vegetation consists of only about thirty species of native plants, plus a number of imported varieties. Coconut palms account for about 90 % of the total, and pandanus and timber trees for much of the remainder, though on Tongareva now there is little available timber, and none of the useful *Calophyllum* trees. There is little soil to support plant life, and that for growing vegetables is sometimes

imported by schooner from Rarotonga. There is a small amount of phosphate on some of the islets but it inhibits the growth of the coconut and hence the natives do not consider it of value as a plant food. Breadfruit from Rarotonga do well if given a little soil to start with, then supplied with leaf mould. Banana plants from Rarotonga and Samoa grow indifferently, but the papaya gives a good return. Vegetables grow well on the whole, especially tomatoes, but sweet potatoes, while they produce good tops which are used by the natives as a vegetable, fail to supply tubers. Citrus fruits also do not flourish.

Animal life throughout the group is poorly represented, the only indigenous mammal being the rat, though this may have been brought by the natives themselves. At the present time, pigs and dogs are plentiful, and fowls are kept. At one time goats were common on Atiu, but most of them have been killed by dogs. There are few lizards, no snakes and no native frogs. Land birds are now scarce though pigeons and duck occur on some of the islands.

History

The history of the Cook islands has been comparatively uneventful. They received their name from the fact that a number of the islands in the Lower Cook group were discovered by Captain James Cook, on his second and third voyages. Christianity obtained a hold in the group from 1822 onwards, under the direction of the London Missionary Society, which had its Pacific headquarters in Tahiti. The people of Aitutaki were the first converts, followed soon afterwards by those of Mangaia and Rarotonga, and then those of the other islands of the Lower Cook group. The islands of the Northern Cook group received Christianity from the same source, but rather later, towards the middle of the century, in all cases native teachers playing an important role in spreading the new faith. For many years the islands were governed by the native chiefs and the teachers under a code of laws inspired by the missionaries and based largely on that formulated for Huahine in the Society group. These laws applied to temporal as well as spiritual conduct, and even to the present day their influence is still evident to some extent in what has been described as the 'mid-Victorian' standards of behaviour of the people.

In the absence of all but agricultural resources, European commercial activity in the islands has never been highly developed. But trade began at a fairly early period. Between about 1830 and 1840

whaling vessels resorted to Rarotonga for supplies, and from about 1840 to 1855 traders, particularly English firms from Tahiti, were interested in the timber, pearls, coconut oil, etc., to be obtained from various islands. Soon after 1860 several islands of the Northern Cook group were raided by Peruvian slavers, and considerable numbers of the people were carried off.

The islands of the Lower and Northern Cook groups were placed under British protection at various times between 1888 and 1892, and in October 1900 those of the Lower Cook group were formally proclaimed to be under British sovereignty after they had been ceded to Queen Victoria by their hereditary chiefs on condition that they should be annexed as part of the British Empire. By an Order in Council of 13 May 1901 the whole of the Cook islands were included within the boundaries of the then colony of New Zealand. In 1915 an Act was passed by the New Zealand Parliament consolidating the laws relating to the Cook islands and Niue, and providing for a Minister for the Cook Islands who was charged with the administration of the government and to whom the Resident Commissioner was responsible. In June 1943, the functions of the Minister were transferred to the Minister of Island Territories.

Population

The estimated total population of the Cook islands (excluding Palmerston) on 31 March 1941 was 13,713. This represents an increase of about 10 % on the population at the last census in 1936, and shows the maintenance of a trend which apparently began about the beginning of the century, and which has shown signs of accelera-

Major Islands	Population in 1906	1916	1926	1936
Rarotonga	2,441	3,064	3,936	5,054
Aitutaki	1,162	1,302	1,431	1,709
Mangaia	1,531	1,245	1,249	1,459
Atiu	918	759	933	1,086
Mauke	446	490	511	652
Mitiaro	210	237	238	265
Manihiki	521	493	416	487
Rakahanga	352	295	327	290
Tongareva	420	326	395	467
Pukapuka	435	474	526	651
Total for *all* Cook islands	8,518	8,917	10,082	12,246

tion. The increase has not been evenly distributed; it is greatest in the Lower Cook group, and especially marked on Rarotonga, where the population has doubled in the last thirty years. The table on p. 523 shows the position in the major islands at ten-year intervals, according to the census reports (Takutea and Suvorov, uninhabited; Nassau, with small temporary population; and Manuae and Palmerston, with populations under 100, have been omitted).

The notable increase in the case of Rarotonga is due in a large measure to its commercial and social attractions. Natives from the smaller islands come there to work, and to live, because of its urban amenities; the net loss of population on Manihiki and Rakahanga and the slow rate of increase on Tongareva are due to this drain.

The non-native element in the population is small. Those classed as non-natives in the 1936 census numbered only 303, of whom 187 were Europeans, the remainder being primarily of European or Chinese descent with a small admixture of native blood. But a proportion of the people classed as natives have also some amount of European blood, since the people of mixed descent have intermarried freely with the full-blood natives. In 1936 the islanders with some European ancestry, often two or more generations back, represented about 10 % of the total population. The people of mixed blood do not form a separate social group, and do not constitute a social problem. As in New Zealand, they mostly attach themselves to the native group, but if personality and economic circumstances lead them to associate themselves with the white group there are no barriers against this.

The distribution of the native population by age is briefly as follows, according to the census of 1936: 43 % are under 15 years, and of these about two-fifths, or 17 % of the whole population, are under 5 years. People between 15 and 45 years represent 42 % of the population and those over 45 years, 15 %. In sex distribution, males slightly outnumber females, being 52 % as against 48 %; this was also the situation in 1926. This proportion of males to females is maintained fairly evenly throughout the age groups. In the group of most immediate interest, from 20 to 40 years, the respective proportions are 14 and 13 % of the total population. In recent years there has been a tendency for the birth-rate to rise and the death-rate to fall; in 1939–41 the average rates per thousand were approximately 39 for births and 17 for deaths. Infant mortality has decreased, strikingly so in proportion to general mortality. In recent years there appears to have been a slight rise in the proportion of female births, but also a rise in that of female deaths.

The Native People

The native people of the Cook islands are Polynesians, closely related in language, culture and traditions to the Maori of New Zealand; they are sometimes referred to as 'the Maori of the Cook islands'. Rarotonga in fact has been proved by comparison of traditions to have been an intermediate stopping-place for ancestors of the New Zealand Maori who arrived from Tahiti in the historic Great Fleet about the fourteenth century.

Physical Type

Physically, the people are robust and well-developed. They are tall, the average stature of a large sample of men being 5 ft. 7 in. (171 cm.) and of women 5 ft. 6 in. (159 cm.). The characteristic Polynesian tendency to brachycephaly is evident—moderately broad heads are shown by the average index of 83 for men and 84 for women, with means for different islands of 79–86 for men and 80–88 for women. Characteristic also are the broad massive face, high narrow forehead, large fleshy nose and full lips. The people are of moderate brown skin colour, with black straight or wavy hair, and full dark eyes, from which however the epicanthic fold (giving a somewhat slanting appearance to the eye) is usually absent. This is fairly common among some other Polynesian groups. The people of the various islands are in general of homogeneous physical type, but there is the closest resemblance between those of Aitutaki and Rarotonga; Atiu and Mauke; Manihiki, Rakahanga and Tongareva, in each case. Those of Mangaia stand somewhat alone, with a narrower head width than the people of the other islands, and a suggestion of a closer resemblance to a New Zealand Maori type; those of Aitutaki and Rarotonga, on the other hand, appear to be more closely allied to a Society islands strain.

Language

All the people of the Cook islands speak dialects of Polynesian. The dialects of the Lower Cook group all closely resemble one another though most of them contain a number of local words characteristic of the particular island speech. Those of the Northern Cook group show more differentiation. In Manihiki, Rakahanga and Tongareva the aspirated *h* is used in speech, whereas in Rarotonga and on the other islands of the Lower Cook group it is omitted or represented by the glottal closure. Again, while those three islands use both *l* and *r*, Rarotongan and the other Lower Cook dialects

use *r* alone. But while Tongareva uses the *s* sound, Manihiki uses *h* instead, and conversely Manihiki uses *wh* where Tongareva uses the *h* sound.

The written form of the dialect in each island was originally derived from native teachers trained by the London Missionary Society in Rarotonga. The result has not been completely satisfactory in rendering the sounds of the native speech, particularly in the Northern Cook group. Rarotongan, on the basis of which the alphabet was compiled by the missionaries, lacks *l*, *s*, and *w*, all of which are present in Tongarevan speech, for instance. Hence many Tongarevan words when written give a false impression of the way they are actually pronounced. Moreover, the missionaries omitted from the alphabet any symbol to represent the sound which is either the glottal closure or in some of the dialects a more or less fully aspirated *h*. If the letter *h* had been used, much confusion would have been avoided. The word *ua* for example, when written, may stand for *ua* (rain), *hua* (fruit), *uha* (female) or *huha* (thigh).

Culture

In disposition the people of the Cook islands are hard-working, proud and independent, but hospitable and generous. Like all Polynesians they lay great stress on kinship by blood and by marriage, and carefully preserve the genealogies which enable them to trace these relationships. An important feature of their social structure in former times, and still to some extent, is the group of people tracing descent from a common ancestor and often bearing a common name meaning 'Children of...'. They formerly also attached great importance to a system of hereditary rank in which the high chiefs, known as *ariki*, traced their lineal descent back to the remote ancestors who by tradition first occupied the islands. At least one such high chief exercised authority in each island, and under him were subordinate chiefs (*mataiapo* in Rarotonga) each in control of a district. In the larger islands there was also a class of gentry (*rangatira*) who by their closer relation to the chiefs occupied a superior position to the common people. At the present time, though the system of hereditary titles has not fallen into abeyance and the chiefs still play some role in the government of their islands, much of the former respect for their position and authority has tended to disappear.

Practically all the land in the group is owned by the natives, and a great deal of it is worked by them. Their ownership is safeguarded by provisions that no native may sell or mortgage his lands, though

he may lease them subject to the approval of the Native Land Court, for a period not exceeding 60 years. The system of land tenure varies in its details in different islands. But except for some recent individualization of titles, it follows the general Polynesian principle of ownership by family groups. Individual occupancy rights are recognized, but general authority is exercised by the family head—and ultimately by the chief—as a kind of trustee. But in some islands family estates and even individual holdings have now been defined by survey. On Mangaia and Atiu and possibly elsewhere it seems to have formerly been the practice to divide up the island into segments by imaginary radial lines from the central point of the island to the coast, each segment being the property of one of the major kinship groups of the community.

In former times warfare, with land, women or revenge as predominant motives, was common. Between the discovery of Atiu by Cook and the visit of John Williams to it, for example, an expedition which set out to revenge the killing of an Atiu chief wrought great slaughter among the people of Mauke and Mitiaro. Peace was restored by the missionaries. Internecine warfare between people of the same island was also not uncommon, though on some islands, such as Mangaia, there was a code of rules which regulated fighting and allowed certain privileges to the vanquished. The military tradition still persists; about 500 Cook islanders enlisted in the New Zealand Forces and fought in the war of 1914–18, and a petition by many more for similar enlistment in this war was refused by the New Zealand government only because they find difficulty in adapting themselves to a cold climate.

In religion the Cook islanders formerly followed the general Polynesian pattern of worship of ancestral spirits and gods who were the personified forms of natural phenomena. Like the New Zealand Maori, however, they constructed few of the elaborate stone temples so characteristic of the Tahitians and some other central and eastern Polynesian communities. At the present time the people are all Christian; about 90 % of them are adherents of the London Missionary Society, and the remainder are nearly all Roman Catholics or Seventh Day Adventists.

Administration

The Cook islands are not self-governing, but have limited powers of local legislation. Under the provisions of the New Zealand Territories Act, 1943, the primary responsibility for the administration of the

dependency rests with the Minister of Island Territories. Executive control is in the hands of the Secretary of Island Territories at Wellington, and is exercised through the Resident Commissioner in Rarotonga. The local seat of government is the double township of Avarua and Avatiu. In each of the other seven major islands the Resident Commissioner is represented by a Resident Agent. In each case the Resident Commissioner or Resident Agent is assisted by an Island Council composed of *ex officio* and elected members. The former may comprise both European officials and native high chiefs (*ariki*), while the latter are nearly always natives, commonly men of rank, though there has been a European elected member in Rarotonga. The Island Councils, subject to certain statutory limitations, pass Ordinances which after the assent of the Resident Commissioner and the Governor-General of New Zealand has been received take effect as law.

The laws of the dependency are those of New Zealand, with some additions and modifications from Local Ordinances. The system is a development from that originally instituted under missionary influence, when the tribal chiefs governed under codes which were a mixture of native custom and Biblical rules. In 1891, after the islands became a British Protectorate, a Federal Parliament was established by the first British Resident; this was composed of the chiefs of the various islands, with the principal of these, Queen Makea, Ariki of Avarua, as head. It passed Acts for the Cook islands as a whole. In addition, there was a Native Council for each major island which also made enactments. In 1899 the statutes of Rarotonga and the other major islands, passed by the Federal Parliament, consolidated and repealed all the ancient laws and all laws made by the Councils. In 1901 the Federal Parliament and the Native Councils were termed Federal Council and Island Councils respectively, and the enactments made by them became Federal Ordinances and Local Ordinances.

The system of justice is carried into effect through the High Court, of which the Resident Commissioner is Chief Judge. This court has both civil and criminal jurisdiction, and appeal lies from it to the Supreme Court of New Zealand. The Chief Judge presides over the High Court of Rarotonga, while in the other islands regular sittings are held by the Resident Agents, who are Commissioners of the High Court, with limited jurisdiction. A total of 1,200–1,300 cases is normally dealt with at Rarotonga, and several hundred cases at each of the other islands in the course of a year, but serious offences are

very rare. In addition, there is a Native Land Court, presided over by a judge; this determines titles to land and settles boundary disputes, which are frequent. In arriving at decisions great importance is attached to native custom, and genealogies and other traditional records are taken in evidence. One of the outstanding Native Land Court cases in recent years was that concerned with succession to the *ariki* title of Makea Nui in Rarotonga; finally, after appeal, decision was given by the Supreme Court of New Zealand. The Cook islands police force consists of one European Chief Officer and about forty-five native sergeants and constables.

The Cook islands administration is a difficult one to finance. The islands are scattered over a very wide area, and each requires separate staffing and administrative expenditure; but communication is scanty, especially with the northern islands. The markets for the only exports, copra, fruit, pearls and pearl shell, are subject to considerable fluctuations, and the northern group is practically non-revenue producing, though because of its frequent hurricanes aid must often be sent from outside. In these circumstances, the budget for the territory has often been balanced only with the aid of the New Zealand government. For the year ending March 1940 the revenue for the Cook islands was £24,942, the expenditure was £53,204, the balance being met by a grant from New Zealand, and much the same occurred in the following year. The assets of the administration are in excess of liabilities to the extent of about £80,000. Revenue is obtained by customs duties and an export tax on copra, which together yield from one-half to two-thirds of total receipts, and also from post office and court fees, and from agricultural resources of the government. Taxation consists of an annual water rate of £1 per house, an annual dog tax of 10*s*., a small road rate on European properties and a rate of 15*s*. per head on Europeans not liable to road rate. Expenditure is largely upon social services: in 1939–40 about 20 % of expenditure was upon health services, 17 % on education, 10 % on public works, and 4 % on agriculture.

Social Services

Medical services include a government hospital at Avarua, with a European matron, and cottage hospitals or dispensaries on some of the other islands. The government supplies free medical attendance and hospital facilities. The staff includes two government medical officers, one of whom is usually travelling round the islands, a district

nurse, and several native medical practitioners from the group who have been trained at the Central Medical School in Fiji. There is a Caldwell portable X-ray plant at Avarua, and a dental clinic; a voluntary child welfare association does useful work on Rarotonga.

Education in the Cook islands is free and compulsory. It is shared between the government and the missions. In 1940 there were eleven government schools with an enrolment of nearly 2,500 pupils, and fourteen mission schools with an enrolment of about 700 pupils, almost equally divided between the London Missionary Society and the Roman Catholic mission. Of the total population of 10 years of age and over in the islands, about 94 % are literate, about 35 % being able to read and write English. In recent years the conception of the scope and purpose of education in the Cook islands has changed considerably. Whereas for long instruction was left entirely to the missionaries, in 1916 the government took over most of the London Missionary Society schools in the Lower Cook group, and in 1922 a superintendent was appointed to introduce a more uniform system. Emphasis is now being put on agricultural education, including the technique of fruit growing and marketing, as being directly related to the practical interests of the people. Associated with this is the growing use of English as the medium of instruction, in order to enable the people to cope more effectively with the new range of ideas in such matters as agriculture and public health. The training of native teachers has also been developed, to meet a long-felt need.

Economics

The occupations of the people are mainly agriculture and fishing. Though of recent years the growing of fruit as well as the preparation of copra, both for the external market, have developed greatly, the people still follow to a large extent their traditional methods of obtaining food. Taro, sweet potatoes, yams, bananas are grown in the Lower Cook islands for domestic use, while in the Northern Cook group a large *Alocasia* akin to taro is cultivated in some islands and the coconut is the staple foodstuff. Throughout the area fish are taken by a variety of methods, and a canoe is almost an essential item of family property. European foodstuffs, however, are also consumed in considerable quantity, being paid for by the cash obtained from exports.

The principal exports from the islands are oranges, bananas, copra and tomatoes, usually in this order of importance (Fig. 159); exports in

smaller quantity include orange juice, pineapples, lemons, grapefruit, arrowroot, coconuts, pearls and pearl shell. Hurricanes and other adverse weather conditions in the islands, fluctuations in world markets for copra, pearls and pearl shell, and competition in the New Zealand market for fruit have all tended to cause considerable variation in the quantity and value of the exports from year to year. The situation of the four major commodities from 1919 to 1939 is seen in Figs. 160, 161. These graphs show the decrease in the value of all exports due to the great economic depression from about 1930 onwards. The quantities exported fell also, but to a less degree,

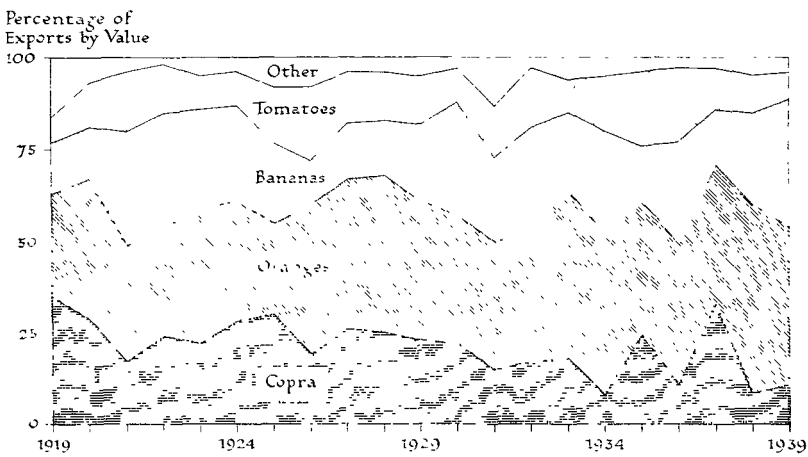
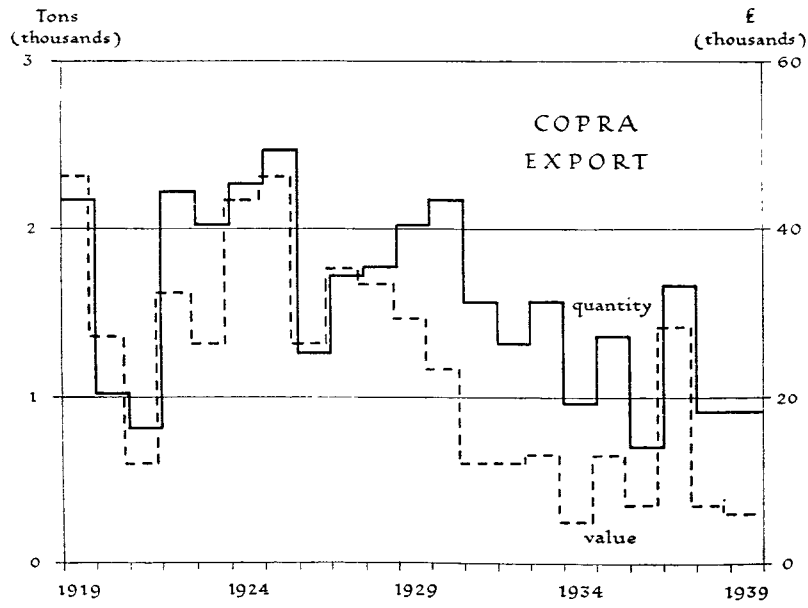


Fig. 159. Proportionate value of Cook islands exports, 1919–39

The percentage of each commodity in relation to the total value of exports each year is given by the distance between points on the upper and lower boundaries of its shaded area. Based on 'Report of the Cook Islands Administration', *Appendix to the Journals of the House of Representatives of New Zealand*, A–3 (Wellington, annually).

partly because the need of the natives for cash to purchase their imported cloth and foodstuffs impelled them to maintain production. But the low prices reacted on output in several ways. In Tongareva the shrinking income from pearls and pearl shell resulted in a diminished output of copra, since the people, in the absence of cash to buy flour, meat and other foods, consumed more coconuts than formerly In the Northern Cook group generally, houses built of wood and iron in flourishing times fell into disrepair and could not be replaced by houses of native style since the traditional building art had been largely lost. In the islands of the Lower Cook group



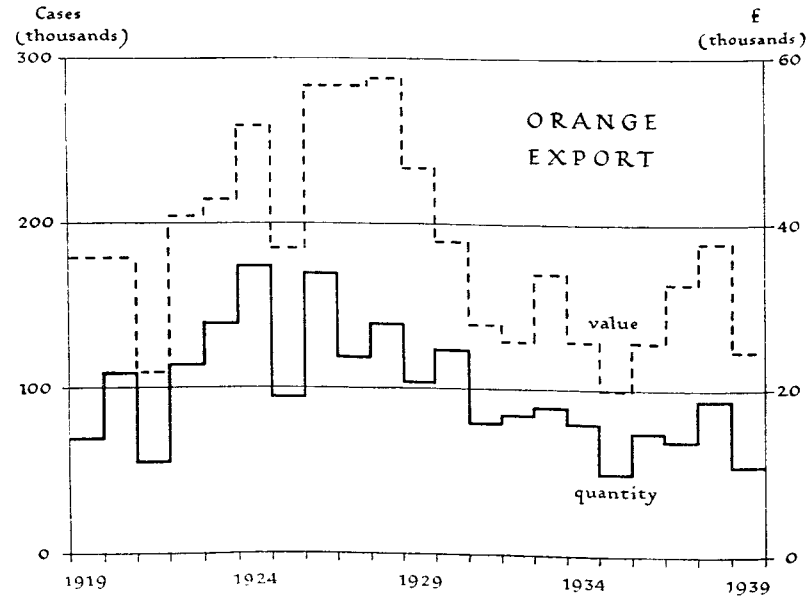


Fig. 160. Export of copra and oranges, Cook islands, 1919–39
Based on the same source as Fig. 159.

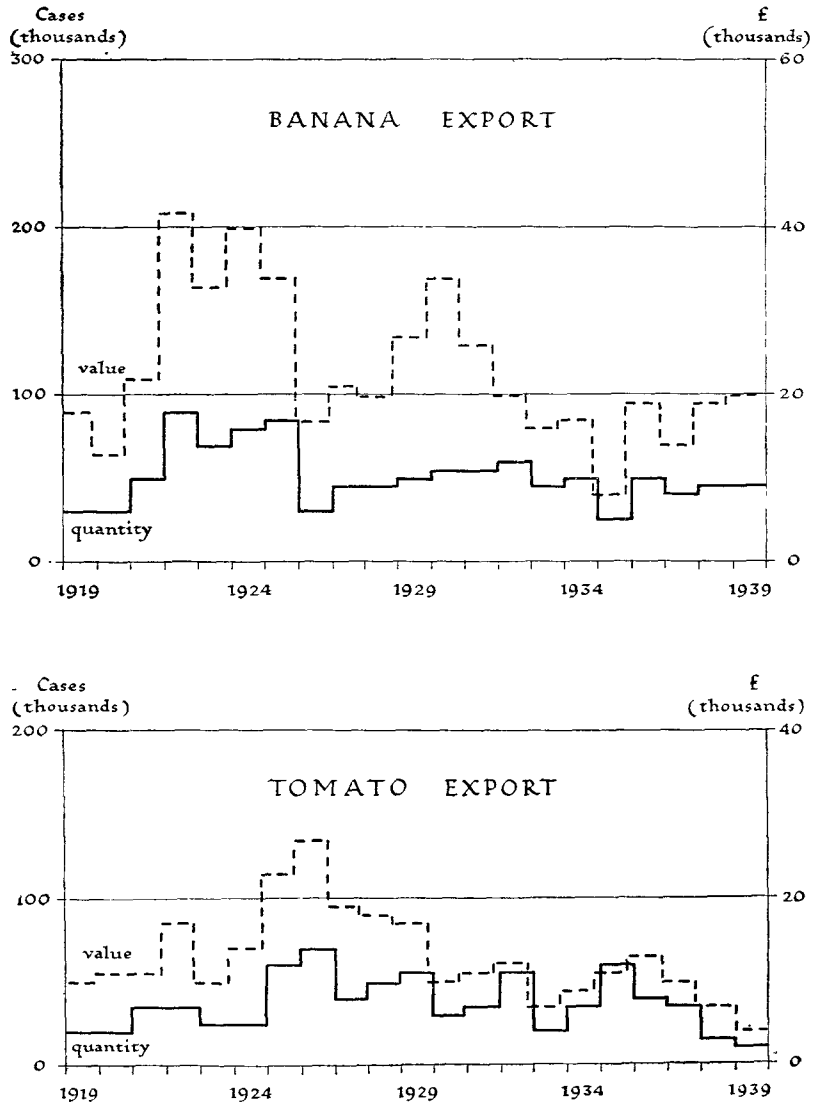


Fig. 161. Export of bananas and tomatoes, Cook islands, 1919–39
Based on the same source as Fig. 159.

the decline in the fruit trade led to the neglect of many plantations, to the detriment of the crop in the following years.

If steady markets could be assured for the products of the islands there is little doubt that their exports could be greatly increased. In 1937, in an attempt to stabilize the fruit industry, regulations were introduced to place the fruit export under administrative control. The Minister for the Cook Islands was empowered to fix maximum amounts for export and minimum prices to be paid for fruit to be exported, and to control packing, grading, etc. The Resident Commissioner, acting for the Minister, was assisted by a Fruit Advisory Committee elected by both native and European growers. As a result of this action, by the end of 1940 a series of gassing rooms had been constructed at the district packing sheds on Rarotonga, Aitutaki, Atiu and Mangaia, and a beginning had been made with the treatment of all oranges with ethylene gas, and debuttoning them, thus maintaining their quality during transit to the market. The administration has taken an interest in agriculture in other ways also. There is an orange nursery and an experimental farm on Rarotonga, and the Agricultural Department there supplies plants to the outlying islands; there is also a system of wharf inspection of bananas exported.

The average annual value of exports from the Cook islands for the decade 1930–9 was £73,000; that of imports to the islands in the same period was £75,000. About 90 % of the export trade and rather more than 75 % of the import trade is with New Zealand, the customs tariff of which operates in the islands, with a few small modifications. The imports comprise mainly timber, drapery, kerosine for lighting, meat, flour, sugar and other provisions, and simple hardware. The import business and retail trade is largely in the hands of a few European firms. The investment of external capital in the territory is primarily in these trading enterprises, though some land, especially on the uninhabited outlying islands, is leased for copra plantations by these firms, and there are some European fruit growers.

Communications

Till a few years before the war regular steamer communication was maintained between Sydney and Wellington with Rarotonga, *en route* for Tahiti and San Francisco. By 1939 this New Zealand connexion had been replaced by a passenger and cargo vessel calling at Rarotonga as part of an island round-trip service from New Zealand. In addition, during the fruit season, from April to October, most of

the Lower Cook islands may be reached by government steamer from New Zealand which calls each month at three or more of the islands. Communication between Rarotonga and the other islands is otherwise maintained primarily by trading schooner, and is irregular, particularly with the Northern islands, which are visited only about six times a year or less. There are no air services to the islands. The only port is Avarua (p. 539).

Roads exist on nearly all the islands, but except on Rarotonga, which has a good motor road encircling the island, they are used mainly for horse and foot traffic. They are kept in good repair. The subsidiary roads on Rarotonga, and probably roads on other islands also, are maintained largely by the labour of the people themselves, with some help from the administration. At the beginning of 1941 there were in the Cook islands forty-eight cars, fifty-seven motor trucks, one motor bus and six motor cycles. Nearly all are privately owned.

No submarine cables touch the islands. A W/T station, under the control of the administration, is established at Avarua on Rarotonga, with seven sub-stations in other islands, namely Aitutaki, Atiu, Mauke, Mangaia, Tongareva, Manihiki and Pukapuka. From Rarotonga, which has a 1½ kW. short-wave transmitter, a regular schedule is maintained with Apia, Suva, Papeete and Wellington. The Rarotonga station has a European operator; the sub-stations have native operators.

THE LOWER COOK GROUP

RAROTONGA

Rarotonga (lat. 21° 12′ S, long. 159° 46′ W) is the principal island in the Cook group, and one of the most beautiful in the south-east Pacific. It is elliptical in shape, the long axis running north-west and south-east, and measures about 7 miles by 5 miles, with a total area of about 16,500 acres.

Physical Geography (Fig. 162)

Structure. The island is primarily of volcanic origin, and very sharply weathered into rugged hills and peaks, of which the most lofty, Te Manga, reaches a height of 2,110 ft. The prominent peak of Hikurangi on the north side (Plate 109), near Avarua, has an elevation

of nearly 1,600 ft., and several other peaks are between 1,600 and 2,000 ft. high. Except for the peaks of Hikurangi and Maungatea the main heights of the island lie along a well-defined ridge running east and west. Branching from this main rampart three ridges with high points extend in a northerly direction and a long ridge without prominent peaks runs south-east. The dividing ridges between valleys are extremely sharp, and the flanks of the hills are often pre-

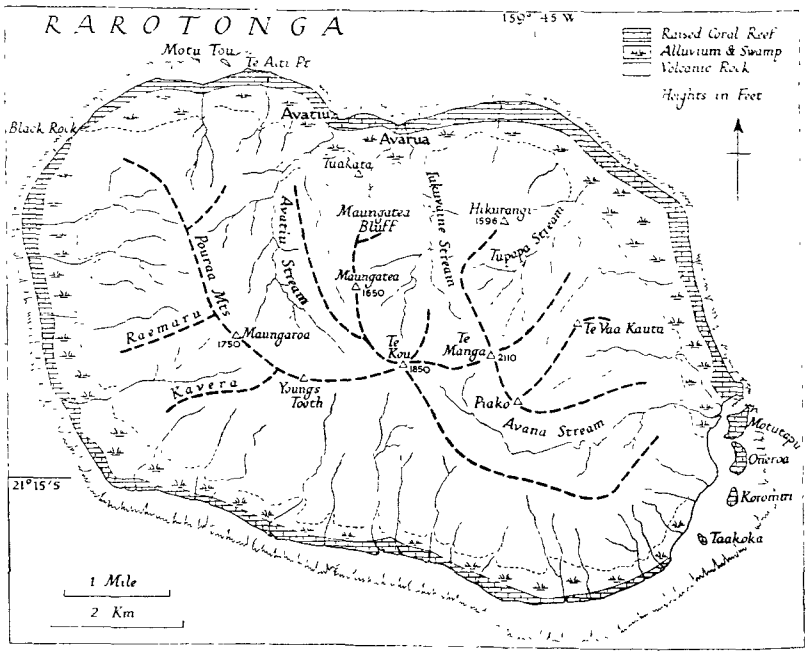


Fig. 162. Rarotonga: physical

For general key to symbols see p. 8. Based on: (1) P. Marshall, *Bernice P. Bishop Museum Bulletin*, no. 72, pp. 11, 30 (Honolulu, 1930); (2) New Zealand Lands and Survey Department map, 1913.

cipitous. At various points are sharp pinnacles of rock, the best known of which is Young's Tooth (Maungatapu), conspicuous from the sea (Plate 108).

From the central mass steep slopes descend to swampy ground, which is formed of volcanic alluvium, and is mostly not more than 200–300 yd. wide. It is drained by subterranean channels leading out to the sea. The streams which drain the high ground normally do not take the overflow from the swamps, but build fans of debris

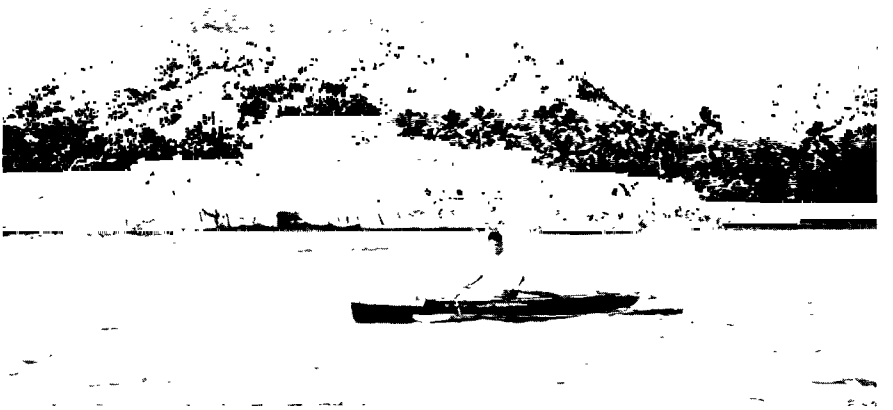


Plate 108. South-west coast of Rarotonga, Lower Cook group

Near Rutaki. The pinnacle on the right is Young's Tooth. The native fishing canoe is of the common single outrigger type.



Plate 109. Interior of Rarotonga

View at Ngatipa, on the north side of the island. The peak of Hikurangi is seen in the background.



Plate 110. South coast of Tutuila, American Samoa

Looking eastwards from a point to the west of the entrance to Pango Pango harbour. The island in the distance is Aunu'u.



Plate 111. On the east coast of Savai'i, Western Samoa

The barrier reef some distance off shore encloses an extensive lagoon, with sheltered waters for small craft. Among those at anchor is a native long-boat (*fautasi*). The coast here is low and flat.

over which they pass at a level higher than the swamp floor. The swampy areas are faced towards the coast by a raised shore belt of unconsolidated coral bedded with sand, probably an old reef. This is about 100 yd. broad and reaches a maximum elevation of about 12 ft. This strand, especially on the west and north, is strewn with coral boulders, and declines to a stretch of dazzling white sandy beach which almost completely encircles the coast. A basalt dyke reaches the sea on both the east and west coasts, its emergence on the latter being known as Black rock.

The island is bordered by a fringing coral reef, varying in width from about 50 to 500 yd. The water covering the reef is shallow, especially on the north and west sides, and at Avarua the reef flat may be crossed dry-shod at low water. On the south side the water is deeper, but at no part does the reef make a definite lagoon.

Anchorage. Outside the reef lies a shallow shelf, 6–8 fathoms deep; this, a condition rare with coral reefs, allows of good anchorage, and has helped to make Rarotonga the principal calling place for overseas vessels. There are two small harbours at Avarua and Avatiu, on the north side of the island; the roadstead there provides sheltered anchorage for vessels of any size, except during strong northerly winds (for details of the port see p. 539). The little harbour of Ngatangiia, on the east side, gives good landing in westerly winds. It was formerly used as a schooner anchorage, and was probably the place of departure of the canoes of the fourteenth-century Maori fleet. A good boat passage also exists at Arorangi on the west side of the island, and there are three others, less good, on the south side.

Climate and Vegetation. The climate of the island is pleasant. For the year as a whole the average maximum temperature is about 80° F., the absolute maximum reached being usually between 89 and 92° F. The absolute minimum is usually between 56 and 59° F. The hottest months are between December and March, when the average day temperature is about 84° F. and the average night temperature about 74° F. From April to October or November average temperatures are about 8° F. lower. Rainfall is moderately heavy, and fairly evenly distributed in frequency, though its volume is heaviest about the beginning of the year. Records are discontinuous, but the mean of 35 years' observations between 1898 and 1940 is almost exactly 80 in. Variation in the amount from year to year is not very great, usually less than 25 in., but a rainfall of 46 in. was recorded in 1915, and 108·6 in. in 1939–40. Though there is no month without rain, in the period from December to March the fall is sometimes

very heavy, while in the middle of the year, especially in June, July and August, it is often very light. In 1927, for instance, as against rainfall of 28 in. in January, 21 in. in February and nearly 12 in. in March, there was only 0·5 in. in June, 1 in. in July and 2·5 in. in August. In recent years the heaviest rainfall in 24 hr. was 9·6 in. in December 1936 and 7·2 in. in March 1940. Hurricanes are rare at Rarotonga, but on 30 December 1904 a tidal wave did considerable damage.

The flora of Rarotonga is more varied than that of the other Cook islands owing to its greater altitude, more diverse soils, and greater variety of possible plant stations. About 560 species of plants are known but over 100 of these have been introduced by Polynesians or Europeans. In general the flora bears a great similarity to those of Tahiti and of Tonga; only eighteen species have been considered as endemic to the island. The distribution of the vegetation follows the common type on high islands. Pandanus, casuarina, hibiscus and coconut, together with some creeping plants and bushes occur on the coast, while at a short distance from the sea front the finely spreading *Barringtonia*, the *Calophyllum inophyllum* (used as a timber tree), the banyan, the breadfruit and many other types of trees and bushes are found. There is a thick undergrowth of ferns, and in damper ground and along stream courses the Tahitian chestnut (*Inocarpus edulis*) with its picturesquely buttressed trunk is common. In recent years, however, the need for planting shade and shelter trees has been felt, owing to the destruction of many of the native trees on the low lands. Candlenut (*Aleurites mollucana*) is abundant on the hills, as well as species of *Coprosma*, *Metrosideros* and other genera well known in New Zealand. The native banana occurs in the deep shady valleys, and great lianas are everywhere, while in all the valleys there are thickets of hibiscus. Tree ferns are to be found, and a type of bracken covers wide stretches of the hillsides. Among recent plants the papaya springs up readily on cleared land, there are orange trees in the valleys, and many guava trees. Taro, a main food of the population, is grown mainly in the swampy ground.

Social and Economic Conditions

Rarotonga is usually said to have been discovered by the Rev. John Williams in 1823, together with Mauke and Mitiaro, as the result of information supplied by native converts in Aitutaki, but it was probably known to whalers earlier.

The population was estimated at 5,689 in March 1941, and appears to be increasing; the figure includes about 200 Europeans and other foreigners. In the last few years several score of young men and women have left the island for New Zealand, where under the control of the Cook islands administration they have contracted for farm and domestic labour.

The people regard themselves as descended from two important migrations about the middle of the thirteenth century, one led by Tangiia from Tahiti and the other led by Karika from Samoa. The lineal descendants of these two leaders are now the principal chiefs of the island. The form of the native society is still fairly well preserved. The island is divided into districts, each administered by a hereditary chief who is responsible to the Resident Commissioner. The most important title is that of Makea Nui, descendant of Karika and high chief (*Ariki*) of Avarua; for a time at the end of the last century a woman, Queen Makea, was the nominal head of the government, and the present holder of the title is also a woman.

Agriculture and fishing are the main occupations of the native people. The island is well watered, the soil is fertile, and there is a large area suitable for cultivation. Nearly all tropical and subtropical fruits can be cultivated, as also many types of vegetables. Yams, taro, bananas, breadfruit, sweet potatoes, tapioca, arrowroot, papaya, mangoes and avocado pears are the chief native foods produced, and early potatoes can be grown on some parts of the island. Oranges, bananas and tomatoes are the main exports. Sugar cane and cotton grow well, but the amount of land available for them is limited. Vanilla grows freely, but is not cultivated. Pigs and fowls are plentiful, and cattle of fair quality are sometimes killed, since there is a government freezing plant. Supplies of fresh milk, eggs, butter and frozen meat are always available to Europeans.

The villages lie round the coast, the double township of Avarua and Avatiu on the north being the chief settlement (Fig. 163). The interior of the island is uninhabited. Avarua is the administrative centre for the Cook group as a whole and the headquarters of a number of trading firms; it has a government-owned hotel and a government hospital.

Port and Communications

Avarua is the main port of call in the group for overseas vessels, and is also the centre for inter-island traffic (Fig. 164).

Anchorage is available in the roadstead in 15–25 fathoms, though it is unsafe in the northerly winds which sometimes occur, especially

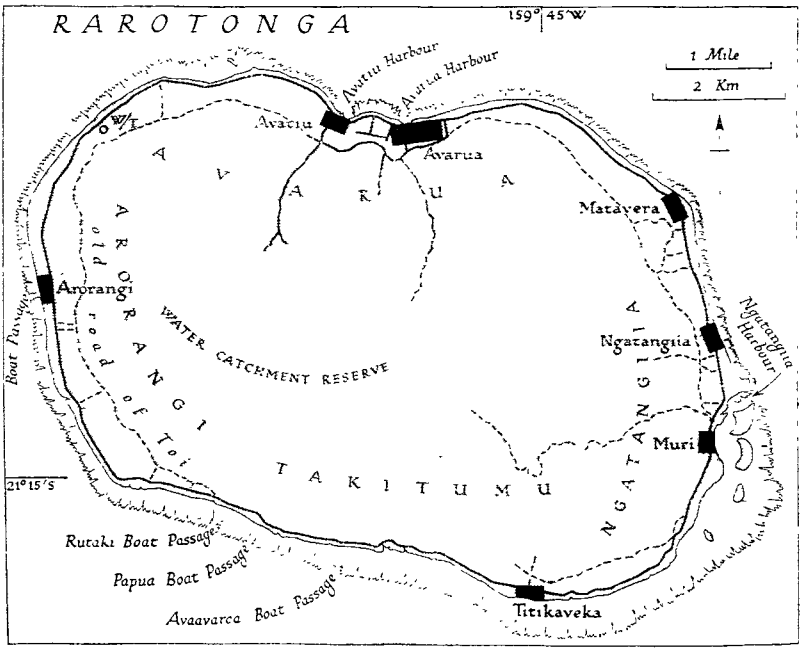


Fig. 163. Rarotonga: roads and settlements

Principal settlements only are shown. Names in large capitals are those of major districts. The 'old road of Toi' is pre-European. Based on same sources as Fig. 162.



Fig. 164. Avarua, Rarotonga

The pier is on the right, with Administration offices behind it; the great bluff of Maungatea rises above. In the distance on the left is the peak of Hikurangi. Based on a photograph.

between November and March. The port itself consists of two small inlets in the reef, about 1,000 yd. apart, and known as Avarua harbour and Avatiu harbour. Moorings are laid in Avarua harbour, which cannot be entered by vessels of more than 100 tons, and there is a pier with 4–5 ft. of water at the outer end. This has storehouses for goods, a tramway, and a 3-ton Diesel-driven derrick. The Union Steam Ship Company maintains eight lighters and two motor boats there. Avatiu harbour is still more confined. There is a pier there.

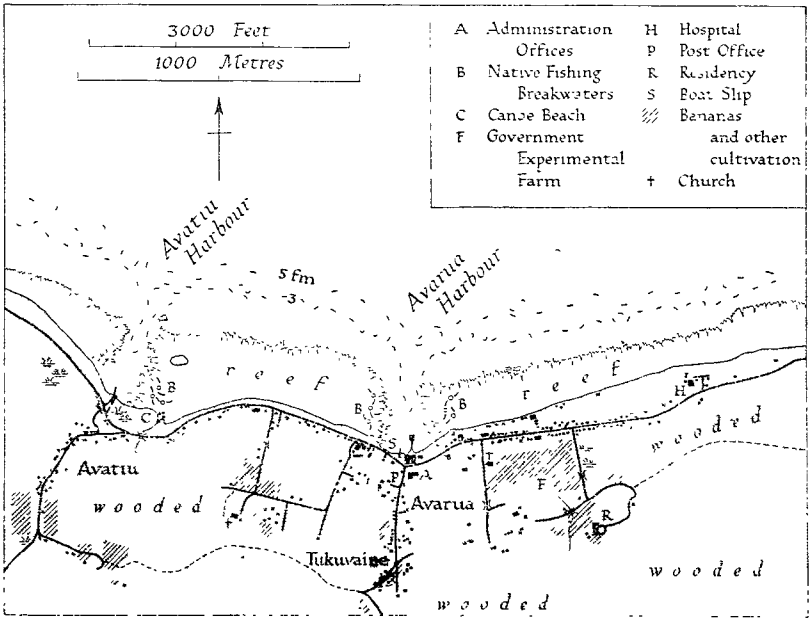


Fig. 165. Avarua and Avatiu harbours, Rarotonga

Roads and buildings are shown as in 1922. Based on Admiralty chart no. 1264.

Roads from the two piers communicate with the main motor road round the island (Fig. 165).

The main motor road is about 22 miles in circuit, and follows the coast, connecting up the villages. From it branch roads (*tapere* roads) lead off up the valleys, but are often not suitable for motor traffic. Small wooden bridges and concrete culverts cross the streams. Round a great part of the island, inland from the maritime flat and the motor road, run the remains of an ancient track known as the 'Great Road of Toi'. Toi, apparently the builder, is otherwise unknown. The road, from 15 to 20 ft. wide and paved for about two-

thirds of its length with flat volcanic or coral stones, follows generally the foot of the hills and cuts across the mouths of the valleys; in former times the principal villages of the island were situated on it.

All the villages of the island are connected by telephone. The parent W/T station for the Cook islands is at Avarua.

MANGAIA

Mangaia (lat. 21° 56′ S, long. 157° 56′ W) lies 110 miles south-east of Rarotonga, and is the most southerly island of the Cook group (Fig. 166). Its circumference is estimated at 17½ miles and its area at 17,500 acres.

Physical Geography

Structure. The structure of the island is very singular. It is surrounded in the ordinary way by a fringing coral reef, mostly not more than 300 ft. wide, but in one part nearly 1,000 ft. wide, and descending abruptly to seaward into very deep water. At the seaward edge of the reef is a ridge, 60–90 ft. wide and 1–3 ft. higher than the rest of the reef, which thus forms a narrow lagoon extending to the shore. Channels penetrating the ridge or rim are useful for launching small canoes, but none of them reach the shore. The shore edge of the reef is bordered by a cliff varying from 3 to 35 ft. high, with little beaches of coral sand and shells at its foot except on the south-east side. Above this low cliff the coast rises in a gentle terrace slope, composed of hard limestone, and from 300 to 600 ft. broad.

At the top of the slope a steep wall of limestone rock, much weathered, rises up abruptly to a height of about 65 ft. This wall, which can be climbed in a few places, forms the outer edge of a broad platform, from a few hundred yards up to 1½ miles wide, which runs in a complete ring round the island. This platform, known locally as the *makatea*, is composed of dense, compact and remarkably pure limestone, and evidently is an ancient coral reef which has become elevated above the sea. The surface of the platform, which slopes up to a height of over 200 ft. above sea level at its inner edge, is very uneven, being formed of hard splintery limestone projecting everywhere in sharp serrated pinnacles 10–15 ft. in height, with numerous crevices and caves. This intricate rocky maze, with its needle-like projections and razor-like edges, is covered with a tangle of interlacing vegetation, and is almost impossible to cross except by the native paths. Between the pinnacles are pockets of red friable soil which are used in parts for native cultivation.

The inner side of the platform falls away in a steep cliff, 150 ft. or so high and very regular; it descends to extensive swamps which receive the drainage from the central part of the island, and which themselves are drained by subterranean channels passing out to the sea underneath the *makatea* at considerable depths. This lowlying land is more than a quarter of a mile wide; it starts from the base of the volcanic slopes about 40 ft. above sea level and descends to about 20 ft. above sea level in a series of artificial terraces (used for growing taro). In one part, which is so low that the water does not completely drain off, is a small lake, lake Tiriara, about 400 yd. long and 150 yd. wide. The centre of the island is a dissected mass of volcanic basalt rock rising in steep but not precipitous slopes from the swamps to a plateau ¾ mile long and ¼ mile wide, with a maximum elevation of 554 ft. above sea level. The slopes, which are much eroded, but show no rocky outcrops, are most even on the north-west side, and steeper on the south and south-east sides of the island.

Judging from its present striking structure, Mangaia has evidently been formed in several stages. An original volcanic cone, truncated and dissected by marine action, in the course of time became surrounded by a fringing coral reef. According to one theory, it then suffered a depression which by admitting the sea round the

lower slopes formed a kind of moat, and gradually changed the fringing reef into a barrier reef. Later again the island underwent elevation, which converted this barrier reef into a high dry ring of coral standing up a little distance inland, while a new fringing reef formed around the edge of the island in its present form. A more recent interpretation, however, is that the original reef continued in fringing

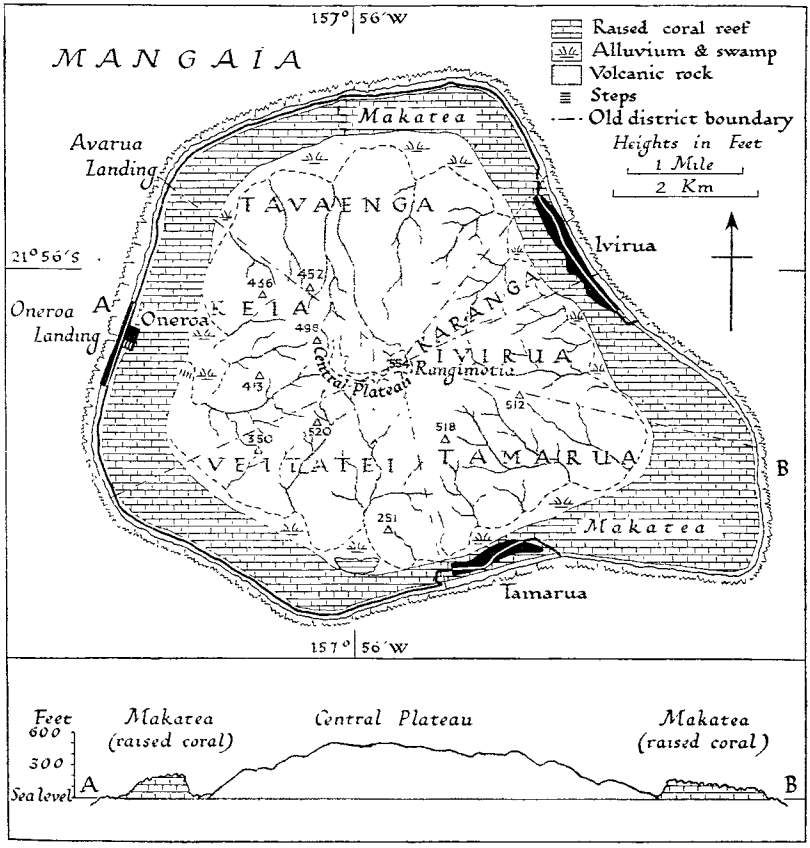


Fig. 166. Mangaia: plan and section

The old district boundaries radiating from the central plateau are shown, with the names of districts in large capitals. Vertical exaggeration of the section, about 5 times. Based on: (1) P. Marshall, *Bernice P. Bishop Museum Bulletin*, no. 36, plate 1 (Honolulu, 1927); (2) Te Rangi Hiroa (P. H. Buck), *Bernice P. Bishop Museum Bulletin*, no. 122, fig. 1 (Honolulu, 1934); (3) Admiralty chart no. 1264.

form to the foot of the volcanic cone and that the present depression with its steep inner-facing cliff was produced by subsequent stream erosion.

Landing. Mangaia has no anchorage since the reef is steep-to everywhere. But since there are no outlying dangers the reef may be approached to within about 200 yd. Landing is made in native canoes, by natural channels in the reef which have been improved by blasting. The landing most in use is at Oneroa, but with

westerly winds that at Ivirua is used, and with south-westerly wind or swell that at Atuakoro on the north side, about 1 mile north-east of Avarua landing.

Water Supply and Vegetation. The island is fairly well watered by the streams which issue from the central area, but these are used primarily for agriculture and washing purposes; for drinking supply the villages depend mostly on government tanks, made of concrete. Two new 800 gal. tanks were added in 1939.

The island as a whole is well covered with vegetation. The volcanic slopes have a thick growth of a scrambling fern (*Gleichenia*) and some casuarina trees, while in the valleys are many shrubs and trees, including the Tahitian chestnut. The flat swampy land at the foot of the slopes is composed of alluvial material and organic matter, and supports cultivated plants, mainly taro. The red soil of the *makatea*, the limestone platform, is composed of the remnants of volcanic material and is especially rich in iron; it has also some phosphoric acid, possibly derived from bird excrement. In it oranges, limes, coffee, sweet potatoes and yams thrive, as well as some coconut palms, the candlenut, and various non-cultivated plants and shrubs. The terrace slopes towards the sea have little soil, but coconut palms have been planted over a considerable area; on the most exposed portion of the coast there is little vegetation, though the pandanus flourishes there.

Social Conditions

Mangaia was discovered in 1777 by Captain Cook on his third voyage. The native culture has been profoundly affected by western culture for more than a century, since the arrival in 1823 of the missionary John Williams. The population is almost wholly Polynesian. In 1823 it was estimated as between 2,000 and 3,000 persons, but during the next century it steadily decreased, partly due to disease and partly to emigration to Rarotonga for employment, till in 1921 it was only 1,230 people. In March 1941, the estimated population was 1,662. The inhabitants live in three villages, Oneroa on the west side, Ivirua on the north-east, and Tamarua on the south side—each with its church. The south-east side is practically uninhabited. Ivirua and Tamarua are built on the *makatea*, as also is a considerable part of Oneroa. This concentration of population on the *makatea* is a post-European phenomenon. Formerly, the lack of water and of ground suitable for taro cultivation there made it unattractive, and the people lived in the interior, visiting the seashore only for fishing.

In former times the people were divided into tribes—a division which still obtains—with hereditary chiefs in control. Temporal power over the whole island was secured by victory in war. The fugitives defeated in battle took refuge in the central hill region, known as the 'mountain', and in caves in the coral walls of the *makatea*. The victors then took over control of the fertile taro lands, and the conquered, after the drum of peace had been beaten, were relegated to the less productive inland valleys. This principle, which had been to some extent formalized, led to frequent changes of secular government. About the beginning of the nineteenth century the island was divided into six districts, each ruled by a chief, assisted by minor chiefs, each of whom was in control of a sub-district.

The administration is now represented by a Resident Agent. Land questions and matters of district administration are decided by the Island Council, consisting of the Resident Agent and representative chiefs, with an assembly of the chiefs of each district as a preliminary body to settle minor questions.

The present system of land tenure follows in essence that established by native custom, though the coming of European law and order has tended to fix the position as it was in the beginning of the nineteenth century. Right of conquest has given the basis of title for much of the land of the present larger landholders, whose ancestors were among the victors when the last battle was fought in 1823. Lands are held by families, with the head of the family as administrator. Inheritance of land is in the male line, but women have rights in the lands of their family during their lifetime. Their husbands and children can work these lands, and this custom in olden days often allowed defeated persons to regain some economic

position after a tribal battle—especially since by native rule marriage was obliged to take place with a person of a different tribe from one's own.

Social services are not greatly developed, but the government maintains three schools and a native medical practitioner on the island, and undertakes responsibility for adequate water supply to the villages. Campaigns directed from Rarotonga by the medical service have done much to check the incidence of venereal disease, hookworm and yaws.

Economics

The economic activities of the people are primarily agriculture and fishing, though since the men are good workers they are much in demand as labourers in other islands.

The land is divided into three types for agriculture: (1) The lowlying region between the inland wall of the *makatea* and the hill slopes. Taro, the staple food, is grown here in the swamps or by terraced irrigation. (2) The narrow upland valleys, mostly covered in fern or forest growth, but with small patches of fertile soil in which taro is grown. (3) The platform of the *makatea*. Here the candlenut trees grow, supplying food in times of scarcity, and in the red soil of the hollows sweet potatoes and oranges are cultivated. In addition, the terrace slopes between the *makatea* and the sea provide coconuts, an important food item. On the 'mountain', the high central land, no food is produced.

Fishing is done on the reef and at sea, mainly with nets and hook and line. The single-outrigger canoe forms part of the equipment of every able-bodied man. These canoes are small, and propelled only by paddles. Their bluff bow and square-cut stern are post-European changes from an old type which still persists in Atiu, Mauke and Mitiaro. Larger canoes of the same build are made and owned by families or groups, acting as a company because of the expense of importing suitable timber from Rarotonga. These are used for transporting cargo to and from the trading schooners and steamers which call. The people prefer their own form of craft to the European whaleboats used elsewhere in the Cook islands for this purpose.

Trade from the island is comparatively small, but oranges are the principal item of export, and bananas, coffee and tomatoes are also shipped. Pigs and poultry are kept, but are used for domestic consumption. There are a few European traders on the island.

Communications

A ship calls on the average once a month, except during the first three months of the year, when hurricanes are possible. Interior communication is by native paths, and by a road which runs about three-quarters of the way round the island, on the terrace slope near the sea, and connects the villages. To climb the wall of the *makatea* steps have been cut at Oneroa and other places.

There is a W/T sub-station communicating with Rarotonga.

MAUKE

Mauke (lat. 20° 08′ S, long. 157° 23′ W), the easternmost island of the Lower Cook group, lies about 150 miles north-east of Rarotonga. It is structurally similar to Mangaia, but is much smaller and lower; its area is about 4,600 acres, and its maximum height is about 100 ft. No proper lagoon exists, but there is a fringing reef up to ¼ mile wide, with comparatively shallow water between it and the coral cliff (*makatea*) which rings the island. The centre of the island consists of a red volcanic soil, and is gently sloping, without deep valleys; between it and the *makatea* is a certain amount of swampy land.

There is no anchorage at the island, but whaleboats land through a rather poor boat passage on the western side. In some weathers it is also possible to land on the eastern and north-eastern sides. A concrete slipway at the main landing was destroyed by a gale on 4 March 1941, but has now probably been rebuilt.

The population, which is increasing, was estimated to be about 760 in March 1941. Nearly all the villages are situated inland. Nukutao is the principal one, while that near the commonly used western landing is Kimiangatau.

Oranges are the main export, a record total of nearly 25,000 cases being shipped during the 1940 season. Only a small amount of copra is exported, but there is considerable preparation of sun-dried bananas, in which there is inter-island trade though none are shipped to New Zealand.

A steamer calls on the average about once a month. A road 20 ft. wide, constructed right round the island, a distance of about 8 miles, was opened to traffic in 1930. It was built entirely by voluntary labour, and involved the work of 175 persons for 30 days each. In 1939 the road to Angataura, the landing on the north-east coast, was regraded and remetalled. A W/T sub-station communicates with Rarotonga.

Mitiaro

Mitiaro (lat. 19° 49′ S, long. 157° 43′ W) lies about 142 miles north-east of Rarotonga. It is small and lowlying, its maximum elevation being only about 90 ft., and its area about 4,000 acres.

There are large areas of barren rocky land at each end of the island and a small area of good land, with volcanic soil, towards the centre, surrounded by swampy ground. In a lake on the island the Mitiaro eel, not found elsewhere in the group, is taken; it is a dainty much appreciated by the natives, and is carried to other islands.

There is no anchorage at the island, though there is a boat landing-place through the reef on the western side. The water supply of the island is ample, with reserves in tanks, which are kept in good repair.

The population was estimated in 1940 as 299, and is increasing. In former times the island was subject to Atiu, but is now ruled by a chief, assisted by an Island Council, on behalf of the government.

There is no steamer communication, owing to the small quantity of produce for export, and schooner calls are infrequent. But there is considerable whaleboat communication with Atiu and Mauke.

Atiu

Atiu lies about 116 miles north-east of Rarotonga.

Physical Geography (Fig. 167)

The island is a coral-rimmed volcanic mass, with a central plateau rising to about 270 ft. above sea level. In structure it is similar to Mangaia, but with its features less distinct, and the coral limestone platform is not marked by the same steep walls. A fringing reef 50–100 yd. wide surrounds the island. Low cliffs 10–12 ft. high front the sea everywhere, but many recesses have allowed the formation of sandy beaches. From the top of the low sea cliff the land rises gradually for about 300 yd. to an elevation of about 70 ft. and then descends slowly for 600–800 yd. to a swampy tract. This elevated belt, the *makatea*, has a highly irregular surface, but the spaces between the projecting pinnacles of limestone are much more completely filled with red soil, especially on the inland side, than on Mangaia. Caves exist in the *makatea*, some as much as 500 yd. long, with an abundance of stalactites and stalagmites. In the past several of them were used by

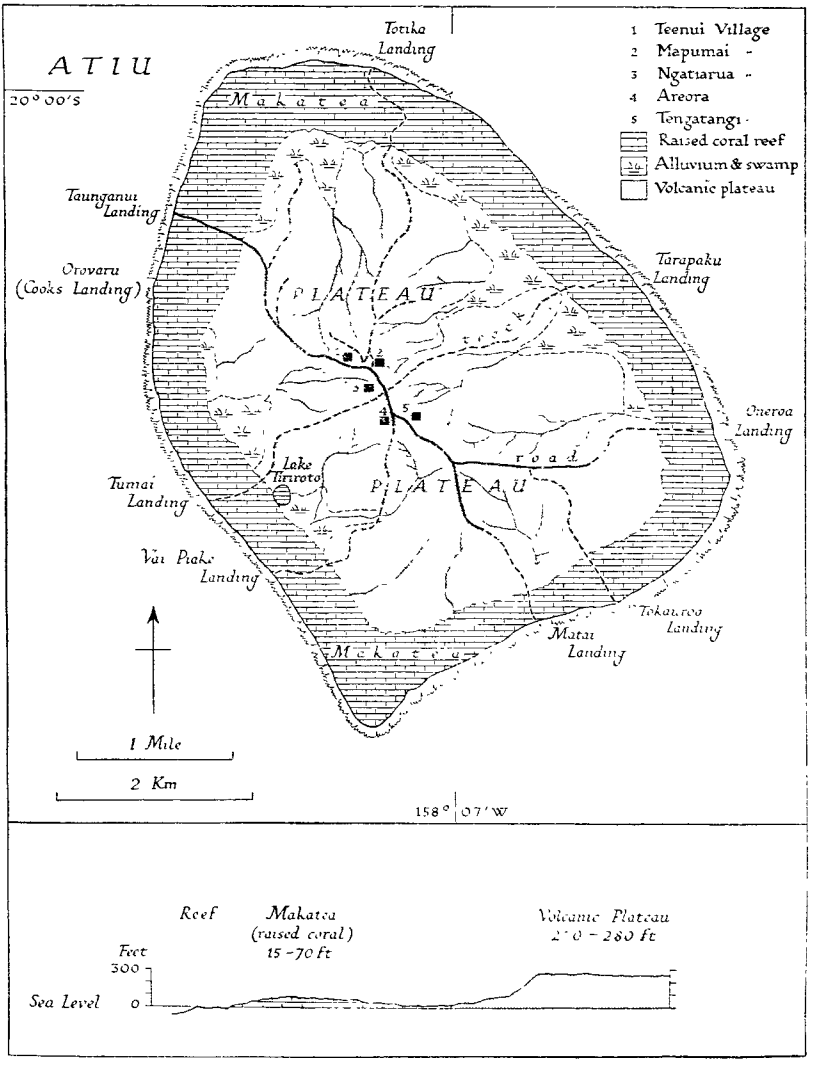


Fig. 167. Atiu: plan and section

The orientation of the section is not definitely known; it is described as a 'general profile'. Vertical scale of the section exaggerated probably about twice. Based on: (1) P. Marshall, *Bernice P. Bishop Museum Bulletin*, no. 72, pp. 51, 53 (Honolulu, 1930); (2) Admiralty chart no. 1264.

the natives as burial places. The swampy area, which is about 10–20 ft. above sea level, is not continuous round the island. In the south it is represented only by a depression, in which bananas are grown. In the wet season much of the swamp is under water, but the small lake Tiriroto is the only permanent sheet of water not clogged with weed. From the swamp edge the land rises more steeply and at the height of 230 ft. flattens out abruptly, to leave the centre of the island occupied by a low dome-shaped plateau with a summit altitude of 270 ft. This plateau is deeply cut by radiating stream valleys.

There is no good anchorage at the island. Temporary anchorage may be obtained by small craft on a patch on the north side, but it is not safe at night. There are two landing places on the west side, but both are difficult; the usual one is the more northerly, at Taunganui. Two other landings on the east side are used in westerly weather; at these the *makatea* has been blasted away to facilitate landing. Two other landings of doubtful quality are on the south side, and one at Totiko on the north side; the last is used in north-westerly winds and southerly swell, when Taunganui landing is not available.

Water is plentiful in the island, from springs, and at three of these, adjacent to settlements, the administration has put in concrete retaining walls to form reservoirs. The soil is fertile, especially the red soil of the *makatea*, which analysis has shown to contain especially oxides of iron and aluminium, with a comparatively high percentage ($2\frac{1}{2}$) of phosphoric acid, possibly due to the accumulated excreta of water-birds.

The small size and relatively low altitude of Atiu prevents it from having a great variety of plant growth. The number of plant species is small and none appears to be peculiar to the island. Near the coast low shrubs and parasitic plants occur, also casuarina trees. Then comes a mixed vegetation, which includes the *Barringtonia*, especially in the south-west of the island. Coconut and banana are most plentiful on the lower volcanic slopes, together with *Hernandia ovigera*, *Calophyllum inophyllum* (both timber trees), paper mulberry and thick growths of hibiscus. At the inner edge of the *makatea* the Tahitian chestnut occurs, and oranges are grown on the *makatea* itself. In the swamps and lower valleys taro, a staple foodstuff, is cultivated, but much of the swamp is waste land covered with rush and weeds. On the plateau are plantations of yams and sweet potatoes, and limes, pineapples, papaya and coffee are also grown. But much of the plateau is occupied by a kind of fern, interspersed by casuarina and guava trees, though the growth is apt to be low on account of frequent fires. The wild banana, common in Tahiti and in some other Cook islands, is rare on Atiu.

Social and Economic Conditions

Atiu was discovered in 1777 by Captain Cook. In 1823 it was visited by the missionary John Williams, who persuaded its chief to become a Christian. Native teachers from the Society islands settled there shortly afterwards, and under their tutelage, with only occasional visits from Europeans, the people quickly became model Christians in the eyes of the missionaries. The later history of the island has been uneventful

The estimated population in March 1941 was 1,186 persons. Formerly most of the people lived on the lower ground near their taro cultivations and the water supply. Owing to missionary influence they later took up their dwellings on the plateau, and occupy five villages close together. Many temporary small huts, however, are still in occasional occupation at the lower levels.

The boundaries of land are still rigidly recognized, each family of standing having a well-defined sector.

Administration of Atiu is conducted by a Resident Agent assisted by an Island Council of chiefs and other leading natives. Social services include a new cottage hospital, with a native medical practitioner, at the main village of Teenui, and there is also a native nurse, trained in Rarotonga, and working particularly on child welfare.

The main export from the island is oranges, noted for their fine flavour; on the average about 20,000 cases per annum have been shipped in recent years. Some copra is also exported when the market is encouraging.

Communication is provided by a steamer which calls on the average about once a month. A metalled road leads from Taunganui to the villages, and some of the other landings are also connected with this by roads of fair quality. In 1930 a scheme to construct a new road round the coast from Taunganui to Orovaru was put in hand, the aim being to supply a shorter route from the villages to the landing.

Atiu has a W T sub-station communicating with Rarotonga.

Takutea

Takutea (also called Fenua Iti, meaning literally 'small land') is a small uninhabited island lying about 16 miles north-west of Atiu. It has a white coral sand beach, and is well wooded. There is no anchorage, and it is doubtful if there is a water supply.

The island is visited occasionally by people from Atiu to collect coconuts and the prized red tail feathers of the tropic bird, which nests there. Fish are plentiful in the waters around the island.

Manuae and Te Au o Tu

Manuae (lat. 19° 21′ S, long. 158° 58′ W) and Te Au o Tu are two small low islands about 1¾ miles apart and about 58 miles north-west of Atiu. They lie in a deep lagoon formed by a coral reef. There is no passage into the lagoon, and anchorage is not safe, though temporary anchorage may be found off the northern point of Manuae in 9–12 fathoms, about 200 yd. off the reef. There is a landing place close by, marked on the chart, and also what is apparently a boat passage blasted out of the reef, and named Turakina passage. The lagoon between the two islets, with deep water and in parts clear of rocks, might provide a suitable seaplane landing place.

Water is available from a well on the northern end of Manuae, but for drinking purposes is apparently provided by catchment from house roofs. The islands are leased by a commercial firm, which employs a few labourers in preparing copra for export; about 200 tons per annum are produced. The population in 1936 was 33 persons, living in a settlement in the north-west of Manuae. The island is visited about four times a year by a schooner from Rarotonga.

Manuae, the first island in the group touched by Captain Cook on his second voyage, was named by him Hervey island after Captain Hervey (afterwards Lord Bristol), one of the Lords of the Admiralty. The group is now often known as the Hervey islands.

Aitutaki

Aitutaki (lat. 18° 52′ S, long. 159° 46′ W) lies about 140 miles north of Rarotonga. It was discovered by Captain Bligh in April 1789 (Fig. 168).

Though its major land mass is of volcanic formation the island has been extended by coral reefs to form a triangular atoll. A fringing reef borders the northern end, but to the south the reef lies far offshore, becoming of the barrier type. In parts it is awash, but there are several islets upon it, most of them on the eastern side. The total land area is about 3,900 acres, and the highest point, near the north end of the main island, is about 450 ft. high.

The lagoon has many coral heads, and there is no entrance to it for ships. Of the several boat passages the main one is Te Rua i Kakau, with two channels, leading to Arutunga on the west side. The north-eastern channel is the better;

though very shallow for much of its length, it does allow the use of whaleboats in loading cargo. The other boat passages are difficult. Anchorage is available, but in easterly winds only, in 18 fathoms off Te Rua i Kakau passage. At the landing place at Arutunga there is a concrete pier, and trolley lines on it facilitate the loading of cargo.

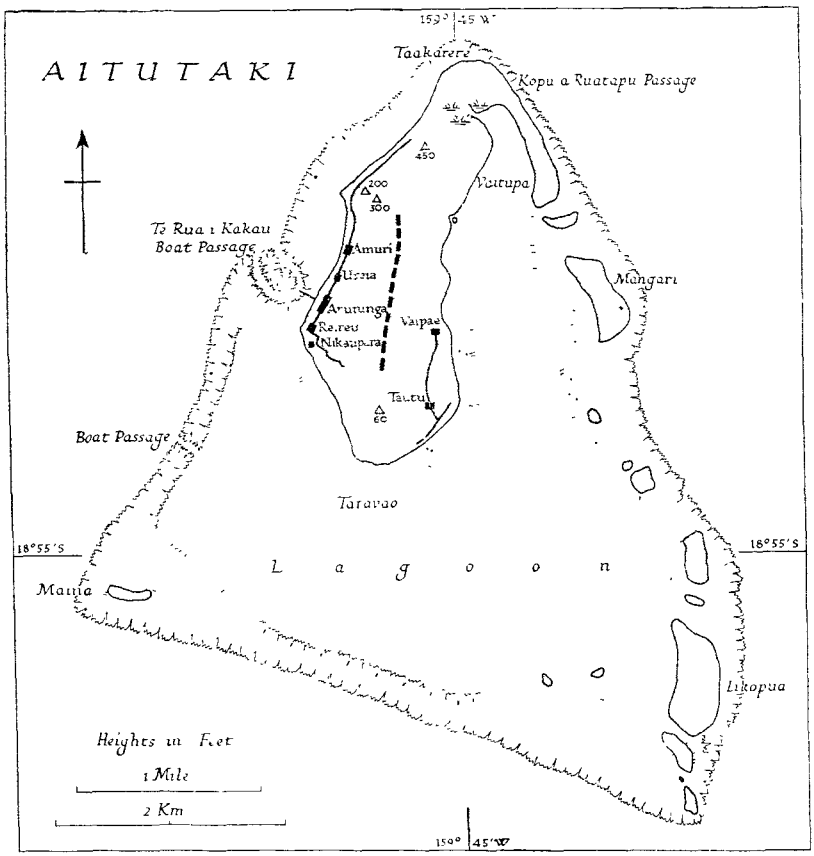


Fig. 168. Aitutaki

Based on: (1) Admiralty chart no. 1264; (2) Te Rangi Hiroa (P. H. Buck), 'The material culture of the Cook islands (Aitutaki)', *Board of Maori Ethnological Research Memoirs*, vol. I, p. xviii (New Plymouth, 1926).

The soil of the island is fertile on the whole, but there is said to be a large area of unproductive land. Most of the island is thickly wooded, though the central ridge is bare in parts. The extreme north end of the island is swampy. Water has been obtained in many parts of the island by boring, and the villages are now well supplied. There are springs in several places along and near the shore. Concrete tanks have been built, and in 1939 four such tanks of a total capacity of 16,600 gal. were erected by the government.

The population in March 1941 was estimated at 2,006, and is increasing. It is distributed among seven villages, of which Arutunga is the principal one. The islets on the reef are uninhabited. All the usual native foods are grown, but there is little taro, owing to lack of surface water. Coconuts thrive well, and the age for bearing is said to be lower than in the other islands of the group. The oranges are of particularly fine flavour, and good pineapples are grown on the east side of the island. Tapioca is produced in quantity, and is in demand by the people of the other islands owing to its quality. Pigs, fowls and a few cattle are raised. Fruit is the main export.

A steamer calls on the average once a month. There are several short stretches of road on the island, the major portion joining the villages on the western side. A W/T sub-station communicates with Rarotonga.

THE NORTHERN COOK GROUP

TONGAREVA

The atoll of Tongareva (lat. 9° 00′ S, long. 158° 00′ W), often known as Penrhyn, is the largest and farthest north of the lagoon islands under the Cook islands administration (Fig. 169).

Physical Geography

Tongareva, about 12 miles long by 6–8 miles wide, is composed of a ring of islets spaced along a reef about 40 miles in circumference, with a contained lagoon of about 108 sq. miles. The islets are of coral and sand, and rise to not more than about 15 ft. above sea level, though the tops of the coconut palms reach to about 50 ft. (Plate 104). The total land area is approximately 4,000 acres.

There are three main entrances through the reef into the lagoon. The largest, Taruia, the west pass, has a depth of 19 ft. for a width of 25–30 yd. and 15 ft. for a width of about 100 yd. Tidal streams run through the pass, usually at a rate of 3–4 knots, but appear to set fairly through. Sekelangi, the north-west pass, is 700 yd. wide, but is so blocked by coral heads that it is not safe for vessels drawing more than 12 ft.; it should be used only with a local pilot and in fine weather. Takuha, the north-east pass, is of similar type, and is exposed to the weather during the trade winds. The lagoon is studded with coral heads, but navigation is possible; conditions are best in bright weather with a slightly ruffled surface. For vessels too large to enter the lagoon there is anchorage off the west side, where the reef slopes gradually to about 10 fathoms, and then drops steeply away. For smaller vessels the lagoon furnishes one of the few safe havens in this region during the hurricane season. Anchorage can be had in 10 fathoms off Omoka village, and trading schooners tie up at the wharf there in a depth of 14 ft. About 1 mile north-east of Omoka there is anchorage in 15 fathoms, and there is also anchorage south of Ruahara, though it is encumbered by coral pinnacles. At Tautua, on the north-east side of the lagoon, trading schooners can go close inshore and anchor on a sandy bottom.

Water is available on the atoll from supplies stored in metal tanks or concrete cisterns for which the corrugated iron roofs of buildings are catchment areas. Omoka has a piped supply down the main street to the wharf. But water is not very plentiful, and the fluid of the coconut is still an important part of the drinking supply; it is regarded as a necessity, not a luxury, by the people. The atoll is subject to hurricanes; one experienced in March 1941 was the most severe for 45 years.

Social and Economic Conditions

The first European thought to have sighted Tongareva was Lieut. Watts in the *Lady Penrhyn* in August 1788. In 1853 the brig *Chatham* was wrecked there, and the trader Lamont spent some time on the atoll, reaching a position of great influence with the natives. In 1854 Christianity was introduced by native pastors of Rarotonga, under the auspices of the London Missionary Society. Laws which applied to temporal as well as spiritual matters were introduced, many of the old customs were displaced and the power of the chiefs was curtailed, much of it being transferred to the missionaries. Churches were built at four social centres, which

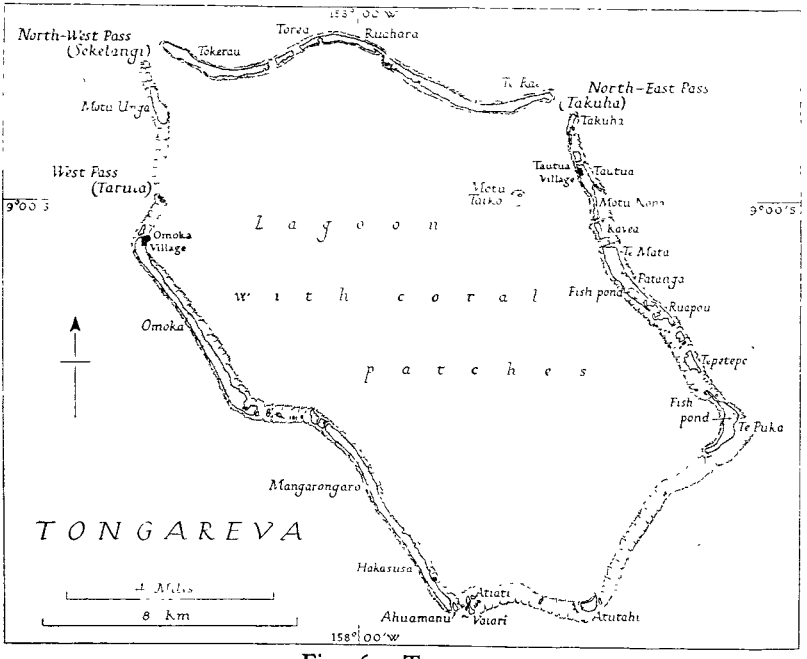


Fig. 169. Tongareva

Most of the larger islets have no integral name, but have only names for divisions recognized by the people. A full set of names and relevant divisions is given in reference (2), where the sketch map, however, differs in some respects from the chart. Based on: (1) Admiralty chart no. 997; (2) Te Rangi Hiroa (P. H. Buck), *Bernice P. Bishop Museum Bulletin*, no. 92, p. 5 (Honolulu, 1932).

became the only villages. But about 1864, after Peruvian slavers had carried off about 1,000 men, women and children, most of whom died abroad, the remnant of the people congregated in the two villages of Omoka and Tautua, which are the present-day settlements. Houses now are made of sawn timber, erected on high piles, and roofed with corrugated iron (Plate 106). The old Tongareva canoe has completely disappeared. The natives now use small outrigger canoes for fishing, made of sawn planks, after the modern Manihiki design, and large sailing boats for diving for pearl shell.

It is likely that the pre-European population was about 2,000, but after the Peruvian raids it declined, to reach its lowest figure of 326 in 1916. The estimated

population in March 1941 was 524. The health of the people is good on the whole, but there is some leprosy. A leper receiving station has been established on Motu Unga, an islet north of Omoka, and lepers from Tongareva and neighbouring atolls are taken there before being sent to Makongai in Fiji.

All the people of Tongareva claim descent from one or more of three main ancestors, of whom two apparently came from other islands in the Cook group by way of Tahiti about the middle of the fifteenth century. Nowadays the three lines have been fused by intermarriage. Formerly small islets and sections of the larger islets of the atoll were occupied by semi-independent groups of people, each under their own chiefs; raiding of coconuts and warfare among the groups were common. Not long before 1853 the people of Tautua had subjugated all the territories on the east coast, but their enemies united against them and they were defeated in a pitched battle. Nowadays the community is more coherent, but the ancient land divisions still hold, and title to land rests upon membership of kinship groups. There are no large unoccupied areas inland, and even in the lagoon shell-fish grounds and rocks are the subject of rights exercised by the local groups which live near them.

The food resources on an atoll of this type are limited. In former times the people of Tongareva were restricted to coconut, pandanus fruit, fish, and the eggs and young of sea birds. Recently a variety of giant taro has been introduced, and is thriving, and pigs and poultry are kept. Fish are caught by several methods. Sharks are snared, flying fish are netted, bonito are trolled, and there is much angling with introduced hooks and lines. The flesh of the giant clam (*Tridacna*) is also used for food, as also that of turtle and porpoise. The importance of the coconut as food is reflected in the sharp definition of rights to land, especially that on which coconut palms grow, and even to the nuts which fall on the ground; these are always private property.

Copra, pearl shell and pearls are the items exported, but in small quantity. The amount of copra shipped in 1932 was 173 tons; in 1935, 35 tons; in 1937, 135 tons; and in 1939, 40 tons. In this last year 9 tons of pearl shell and £400 worth of pearls were also exported.

External communication is maintained by trading schooner from Rarotonga, with about six calls a year. A W/T sub-station communicates with Rarotonga.

Manihiki and Rakahanga

Manihiki and Rakahanga, atolls about 20 miles apart, are situated about 200 miles west-south-west of Tongareva. Historically they have been so closely connected that it is convenient to discuss them together (Figs. 170, 171).

Physical Geography

Manihiki (lat. 10° 24′ S, long. 161° 01′ W) is the larger of the two atolls, about 5½ miles long by about 5 miles in greatest width. The land rim, which covers about 1,250 acres, comprises a long narrow islet along the north-east side, and another on the southern part of the west side, with many small islets on the south side. The lagoon, which abounds in pearl shell and giant clam shell, has many reefs and there are no large passages into it. The boat landings opposite the two villages are short breaks in the reef and boats or canoes must be run up on to the reef, over which they are dragged to the deeper water on the inner side of the reef flat. Work has recently been in progress in blasting a small boat passage through from ocean to lagoon. There is no good anchorage, but temporary anchorage, fair in the south-east trades, can be had about 1,800 yd. north of the main village on the west side and about 200 yd. from the reef.

Rakahanga (lat. 10° 03′ S, long. 161° 06′ W) is about 2½ miles long by about 1½ miles in greatest width. The land rim, which is fairly continuous, contains about

1,000 acres. There is a boat passage into the lagoon through a winding fissure in the reef just to the north of Te Kainga islet; it has been improved by blasting. It is reported that a new passage cut through the reef on the south side makes it possible for landing to be made in almost any weather. Anchorage can be obtained off the north-west point of the island in 8 fathoms.

The climate on both islands is usually good, though they are subject to drought and to occasional hurricanes. The hurricane which visited Rakahanga in 1914 was the first for many years. In February 1899 a seismic sea wave did much damage to both islands. The water supply on both atolls is from wells and concrete tanks. On

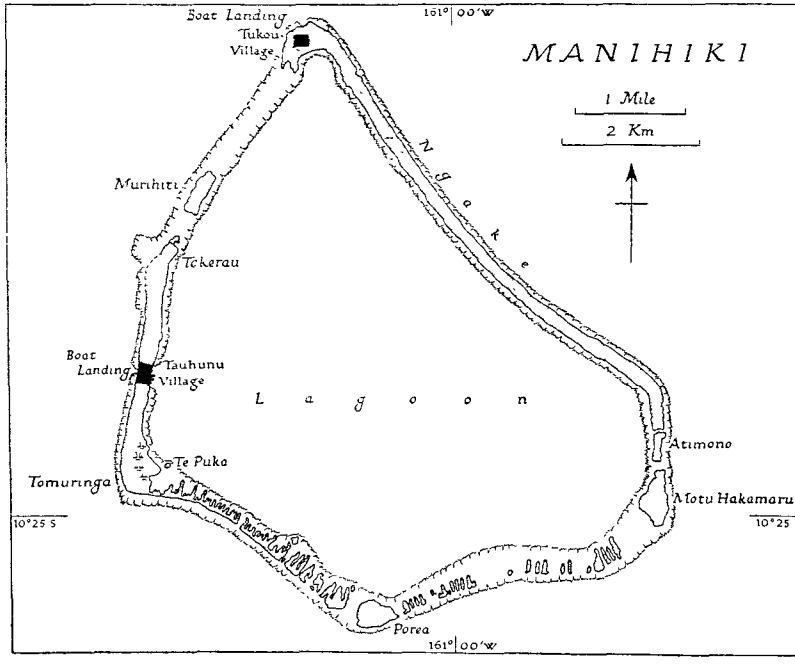


Fig. 170. Manihiki

The broken line on the west side indicates an unsurveyed area. There is some doubt as to the correct shape of the islets on the south side of the atoll. Based on: (1) Admiralty chart no. 979; (2) Te Rangi Hiroa (P. H. Buck), *Bernice P. Bishop Museum Bulletin*, no. 99, p. 6 (Honolulu, 1932).

Manihiki there are two 5,000 gal. tanks at Tukou, and a 10,000 gal. tank at Tauhunu. Rakahanga has a spring of medicinal water near the lagoon edge by the village; it has been walled and fitted with a pump and is used by persons suffering from rheumatism and skin diseases.

The soil of the islets is shallow, and there is no great range of agriculture. The most prominent trees are coconut and pandanus. On Manihiki there were formerly groves of *Cordia*, *Calophyllum* and *Tournefortia*, but they have been greatly depleted owing to the demand for timber for houses and canoes. The *Pisonia*, a softer wood of less value, is still abundant. Next to the coconut palm the pandanus is the most useful tree; its leaves are made into mats, house walls, fans, hats and boat sails, and its fruit is eaten. In recent years cultivated food plants have been introduced

by the government. The fauna of the islands is small, apart from marine life. Rats and coconut crabs have done much damage to fruit on Rakahanga, and mosquitoes and flies are a pest there. In 1936 surface-feeding fish were introduced into the swamps to prey upon mosquito larvae, and much progress has been made in cleaning up insect breeding places in the villages and installation of fly-proof latrines.

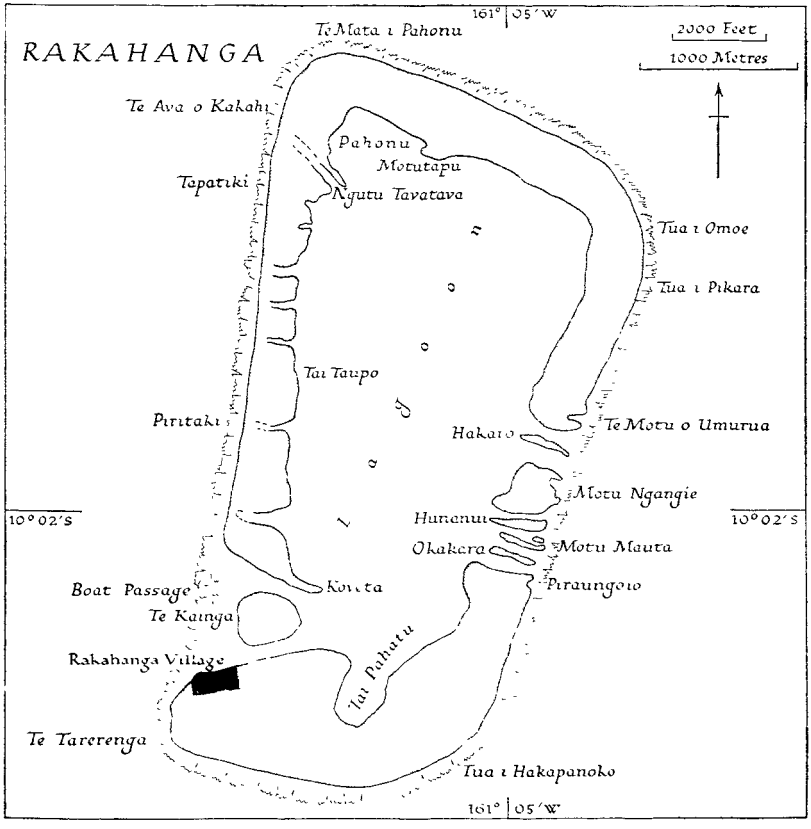


Fig. 171. Rakahanga

Many shallow channels separating islets are not shown. Based on: (1) Admiralty chart no. 979; (2) Te Rangi Hiroa (P. H. Buck), *Bernice P. Bishop Museum Bulletin*, no. 99, p. 7 (Honolulu, 1932).

Social and Economic Conditions

Bellingshausen, leader of a Russian exploring expedition, discovered Rakahanga in 1820; Manihiki was discovered by Captain Patrickson in the American vessel *Good Hope* in 1822 and named Humphrey's island. Rakahanga, which Bellingshausen had named Grand Duke Alexander island, Patrickson named Reirson island. The first effective contact with Europeans, however, was in 1849,

when the London Missionary Society's vessel *John Williams* called at Manihiki to land some people who had been blown off their course on a sailing trip to Rakahanga. By 1852, after the reception of native teachers from Aitutaki, most of the inhabitants had become Christians.

The people of Manihiki and Rakahanga are sprung from one family of Polynesian settlers, who landed on Rakahanga about the middle of the fourteenth century. With the increase of their descendants the need for formal organization was felt, and a title to chieftainship was instituted. This title was later split into two and each chief, who had priestly functions as well, ruled over two of the four small tribes into which the people came to be divided. The dual chieftainship gradually fell into abeyance after the advent of Christianity. Meanwhile the growing needs of the increasing population led to the planting of coconuts and a variety of taro on Manihiki, the land of which was distributed among the tribes and their subdivisions. Nowadays the rights of families to land are often expressed in terms of the coconut palms marking the boundaries.

The whole population once lived on each atoll in turn, moving to and fro according to the food supply. The voyages were made in double sailing canoes, with the Magellan Clouds as guide, since the atolls are too low to be seen from each other. In 1852 these voyages were abandoned at the instance of the missionaries, who were impressed by the loss of life they caused. The population was then divided, and each atoll was occupied permanently. Since then, the population has suffered at times through emigration to Rarotonga, where there were better opportunities of employment, but has recently recovered. The estimated population of Manihiki in March 1941 was 556, and of Rakahanga was 329. On Manihiki about two-thirds of the people live at Tauhunu.

The native foods consist of coconut, giant taro, the fruit of the pandanus, giant clam and other shell-fish, fish of many kinds, land crabs and crayfish. All the islands are thickly covered with coconut groves, many of the palms having been self-planted. A variety of taro is grown in excavated areas, especially on Rakahanga, and on this island the spoil from the excavations forms large mounds to which the people retire to avoid the high tidal waves that inundate the land during severe hurricanes. Recently considerable attention has been paid to the coconut plantations, and breadfuit, bananas, sweet potatoes and other plants have been introduced by the Department of Agriculture in Rarotonga.

The old types of canoes have completely disappeared, even to the small dug-outs formerly used in fishing, and imported sawn timber is now used in canoe construction. The men are good artisans, and have picked up European methods of woodwork. The modern canoes are flat-bottomed, with covered bow and stern and a single outrigger.

Exports are copra (from both atolls) and pearl shell (from Manihiki), both in small quantities. From 150 to 300 tons of copra and 10–25 tons of pearl shell are shipped from Manihiki and from 100 to 200 tons of copra from Rakahanga each year. There is also a small occasional export of pearls from Manihiki.

Administration is carried on by a Resident Agent on Manihiki, assisted by an Island Council of eight men nominated from each atoll. Education is in the hands of the London Missionary Society and a Roman Catholic mission, and many of the natives now speak and write English.

Communication is maintained by a trading schooner from Rarotonga, which calls at each atoll five or six times a year. Each atoll has a system of roads, but they are short and carry little traffic. There are no air communications. It is said that the lagoon of Rakahanga would provide excellent mooring for seaplanes; that of Manihiki would be dangerous because of coral heads. The only signal communication is a W/T sub-station on Manihiki; this was established in 1937 and maintains contact with Rarotonga.

PUKAPUKA

Pukapuka (lat. 10° 53′ S, long. 165° 49′ W) lies about 720 miles north-west of Rarotonga. It is known also as Danger islands (Fig. 172).

Physical Geography

The atoll consists of three islets connected by broad barrier reefs, which are awash on the western side but have a number of shifting sandbanks on the eastern side. For about 3 miles westwards of the western islet a sunken reef stretches; there are depths of 8–30 ft. over it, and since none of the patches break in fine weather, and some of them not continuously in bad weather, the area is dangerous.

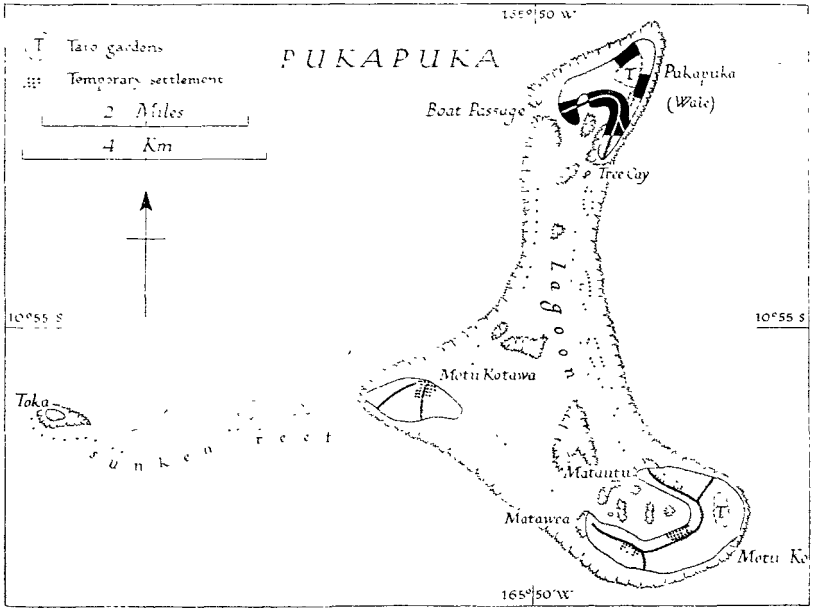


Fig. 172. Pukapuka

The dotted rectangles represent groups of houses used intermittently, mainly during the preparation of copra. The roads are broad tracks, mostly unfitted for vehicles. Based on: (1) Admiralty chart no. 979; (2) Ernest and Pearl Beaglehole, *Bernice P. Bishop Museum Bulletin*, no. 150, p. 8 (Honolulu, 1938).

The total land area is about 1,250 acres. The islets are all low, maximum elevation being not more than 40 ft. The northern islet, where the entire population of the atoll lives, is known as Pukapuka, or locally as Wale ('home'). The southern islet, Motu Ko, and the western islet, Motu Kotawa, are visited occasionally for food and the preparation of copra; each has a small number of permanent houses occupied during the visits.

Anchorage is possible only with south-easterly winds, off the south-west side of Pukapuka islet. Landing can be made here, by a cutting in the reef; this can be used by ship's boats at high water only, and at other times canoes or flat-bottomed boats must be used for transporting passengers and cargo to the landing beach,

which is about 1 mile from the entrance to the cutting. The lagoon, which is about 5 miles long and from 1 to 2 miles wide, is shallow for the most part, with many reefs and coral heads at each end, but is clear in the centre, with depths to about 50 ft.

The climate of Pukapuka is hot but equable. For the years 1930–5 the mean annual temperature is stated to have been between 81 and 84° F., the maxima having ranged between 87 and 92° F., and the minima between 67 and 75° F. Both maxima and minima vary only slightly from month to month throughout the year. Rainfall appears to be moderately heavy. For 1930–5 the annual rainfall ranged between 113 and 156 in., with a mean of 128 in. But it is apt to be very unevenly distributed through the year. The heaviest falls occur from October to March, and the remainder of the year may be very dry. In bad years the taro in the swamps may be so affected during this season that most of the crop dies. In the past great food scarcity has thus been experienced at times.

The winds conform to the general type of the region. From May to October the prevailing winds are the easterly and south-easterly trades; from November to April variable northerly and north-westerly winds occur, often with storms and electrical disturbances. Pukapuka is just outside the regular hurricane belt, but there are records of hurricanes. One of the worst occurred in January 1914. The government schooner then transported fifty-two people to Rarotonga and settled them there till food supplies again became normal on Pukapuka. Tidal waves have swept the atoll on several occasions.

Water for domestic use was formerly obtained only from seep holes and wells sunk close to the beach. This is still used for bathing and occasional consumption, but three concrete cisterns with catchment from the courthouse and church roofs now provide most of the drinking water.

The atoll is thickly covered in vegetation. Coconut and pandanus are prominent, and there are scattered trees of *Tournefortia*, *Calophyllum*, *Cordia* and other types common in this equatorial region. Motu Ko is covered largely with scrub forest and clumps of coconut palms, while Motu Kotawa has the tallest and most luxuriant growth, with *Pisonia* trees up to 80 or 100 ft. in height.

Social and Economic Conditions

Pukapuka was discovered by Commodore Byron in H.M.S. *Dolphin* in 1765, but it was rarely visited by Europeans for the next century. In 1857 the first native teachers of the London Missionary Society landed, and within five years most of the people had been converted to Christianity. Peruvian slavers visited the atoll about 1863, removing about 100 men and women, of whom only one returned. The island was formally annexed to Great Britain in 1892 and was included in the New Zealand administration in 1914. The estimated population in March 1941 was 702.

There are three villages on Pukapuka islet, joined by the main road. Yato lies in part on the south-west heel of the horseshoe, near the landing beach, and in part beyond a causeway built across an arm of the lagoon about sixty years ago. Ngake formerly occupied the south-eastern heel, but after a tidal wave in 1914 was rebuilt farther inland. Loto lies at the back of the bay between them (Fig. 173).

Since the soil of the atoll is poor, mostly coral sand and gravel, there is only a small range of food plants. Coconuts grow well, but taro and bananas grow only in excavated pits filled with plant material, and must be fertilized with leaf and ferns twice a year. Several large depressions are utilized as taro gardens. A few papaya and limes grow on Motu Kotawa, and breadfruit has been introduced from Rarotonga. Much of the land, the barrier reef and all fishing grounds are divided among the three villages as controlling economic units, and guards of men and women watch the reserve food lands, and search for contraband. Other lands are controlled by kinship groups, with inheritance mainly in the male line. Fishing is practised by a great variety of methods. Two types of canoe are in use, both

employing the single outrigger. The simple dug-out is used for fishing off the reef; the plank canoe with washstrakes and bow and stern covers is used for fishing out at sea and for expeditions to the other islets of the atoll. Some of the plank canoes are large craft, as much as 50 ft. long, and hold a dozen men or more.

Changes in the culture of the people due to European influence have been considerable. The Pukapuka dialect has largely given place to Rarotongan, the official

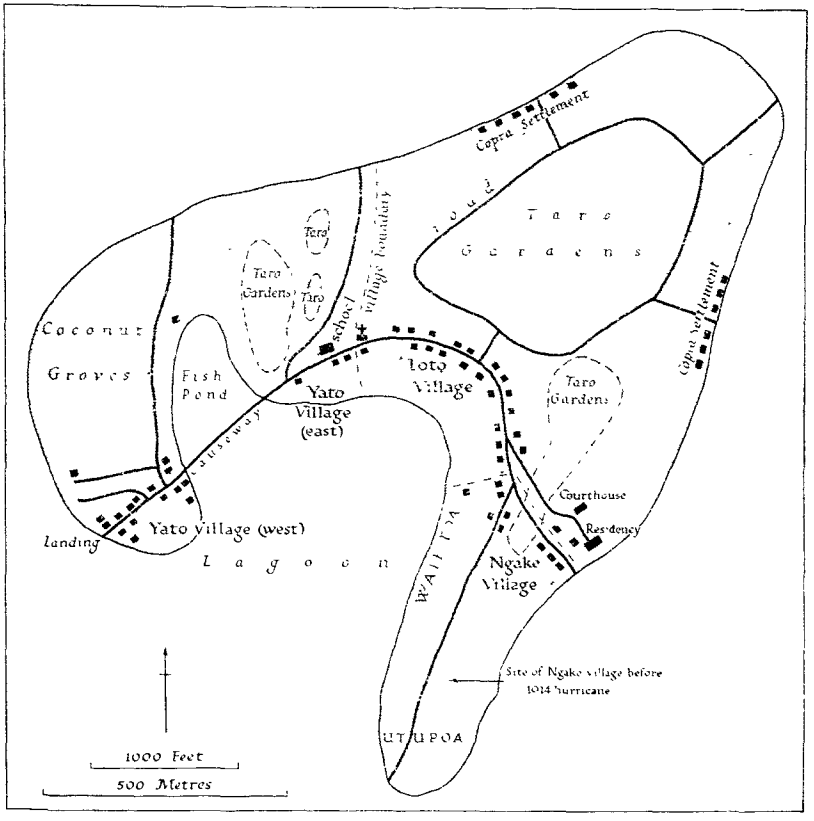


Fig. 173. Pukapuka islet (Wale)

The taro gardens occupy depressions. The copra settlements are not in permanent occupation. Based on Ernest and Pearl Beaglehole, *Bernice P. Bishop Museum Bulletin*, no. 150, p. 18 (Honolulu, 1938).

language of the government and the missions; many of the people live in white-washed lime-walled houses (Plate 107), and all wear clothes of a simple European kind; the old religion has disappeared, and many customs have changed. But some aspects of the ancient social system still remain, and a supreme chief and a number of other chiefs and sub-chiefs still exercise some influence.

The administration of the island is conducted by a Resident Agent, assisted by the native authorities. There are few social services, but there is a government school. In 1940 two serious cases of illness were dealt with from Rarotonga by

wireless. Trade is on a very small scale, copra to the amount of about 100 tons per annum being the only export.

Pukapuka is one of the most isolated islands of the Cook group. A schooner calls only once every three months, or at even longer intervals. Communication in the island itself is maintained by canoe between the islets, and all three of these are intersected by paths. On Pukapuka there is a main road, well kept and bordered by coral boulders, running in a semicircle from one heel of the horseshoe to the other. A W/T sub-station communicates with Rarotonga.

Nassau Island

Nassau (lat. 11° 33′ S, long. 165° 25′ W) lies 45 miles south-east of Pukapuka. It is a coral island, of oval outline, a little less than 1 mile long east and west by about ½ mile wide. There is no lagoon. The land is low and flat, with a few sand dunes and shallow depressions, but the tops of the trees reach a height of 60–75 ft. above sea level. The area is about 300 acres.

The island is bordered by a fringing reef, not more than 150 yd. wide, and off this the water is deep, with no anchorage. During the south-east trade winds landing is best on the north-west side, but from October to May, when winds are liable to be from west or north-east, it is better on the south side. The beach for the most part is a narrow strip of sand, but on the north-west there is sandstone of compacted coral debris, and reef rock, dipping to the north.

The island is thickly wooded. Immediately behind the beach is a growth of *Scaevola*, *Tournefortia* and pandanus, while much of the interior has been planted with coconut palms. Among these are scattered trees of *Pisonia*, *Cordia* and *Calophyllum*, with bird's-nest fern and polypodium; sedges, with some taro and bananas, originally planted, grow in swampy areas. In these swamps are pools of scum-covered water, which is reported as drinkable. Fauna comprises mainly a few sea birds and migratory birds, some pigs and poultry run wild after introduction, lizards, crabs, and insect pests such as flies and day-biting and night-biting mosquitoes. Edible fish are plentiful off the reef.

According to tradition, Nassau was occupied by people from Pukapuka in ancient times, and intercourse between the two islands is said to have obtained about the seventeenth century. The permanent settlement ceased, however, and though occasional fishing trips were made up to the time of white contact, the island was known as Te Motu Ngaongao (deserted island).

Nassau was sighted in 1835 by an American whaling master, who gave it the name of his vessel, but it was probably discovered by whalers earlier than this. In 1881 the island was in the possession of an American, who had planted 14,000 coconut palms, as well as bananas and other food plants, and who employed natives from Pukapuka. It was annexed to Great Britain by Captain Gibson of H.M.S. *Curaçoa* in 1892. About 1916 Nassau was leased by the Samoa Shipping and Trading Company, and worked as copra plantation till about 1926. After being abandoned for some years the island was recently reoccupied by a European with about thirty natives from Tokelau.

There is no regular communication, but schooners probably call at long intervals with supplies and collect copra.

Suvorov Islands

Suvorov islands (approximate lat. 13° 15′ S, long. 163° 05′ W) lie 170 miles south-east of Nassau. The name is often written Suvarov, and popularly known also as Suwarrow, which form is used in New Zealand official publications. Suvorov is an atoll comprising several wooded islets on a reef of roughly circular shape, about 11 miles east and west by 10 miles north and south. The total land area is about

600 acres. The major part of the reef is very little above high water, and it is dangerous of approach on the south and south-east unless the weather is clear.

There is an entrance to the lagoon, just east of Anchorage island, one of the larger islets, with an area of about 80 acres. This entrance is available to vessels of 15 ft. draught, and leads to anchorage in 18 fathoms on the west side of Anchorage island. There is a pier here at which landing may be made from small boats. Like all the Northern Cook islands, Suvorov is subject to hurricanes, and it was recently reported that one in March 1941 destroyed all boats at the atoll. The entrance is reported as now filled, so that island schooners may no longer be able to enter.

There is no water on the island other than from a tank at the pier. The islets are low, but some of them are covered in coconut palms and tall trees, which reach a height of 60–100 ft. above sea level; the others have only scrub and low trees with a height of about 15–30 ft. Sea birds are present in great numbers, and the atoll has been declared a bird sanctuary by the New Zealand government. There is good fishing in the lagoon and around the coast.

The atoll was discovered in 1814 by Lieut. Lazaroff, commanding the *Suvorov*, a vessel of the Russian-American Company. There is no native population, but the island is visited occasionally for the collection of copra and pearl shell, the latter being plentiful in the lagoon. About 1876 the islands were leased to Messrs Henderson and Macfarlane, an Auckland firm, and were declared a protectorate of Great Britain on 22 April 1889. In 1903 the lease was acquired by Lever Brothers, who attempted to introduce gold-lipped pearl shell from Torres Straits, but without success. A hurricane in 1914 spoiled the atoll for pearl-shell operations and did much damage to the coconut plantations. Copra is still being produced there in small quantity, but there is apparently no exploitation of the pearl shell. On account of the good passage into the lagoon a portion of Anchorage island was set aside as an Admiralty Reserve.

Till recently there was no regular communication with the atoll, but in 1941 a New Zealand government W/T and meteorological station was set up there.

Palmerston Atoll

Palmerston atoll (lat. 18° 04′ S, long. 163° 10′ W) is the most southerly of the Northern Cook islands. It lies about 280 miles south of Suvorov and 270 miles north-west of Rarotonga. It consists of six sandy islets on a coral reef extending for about 7 miles north and south and 5 miles east and west, enclosing a shallow lagoon. The whole atoll is low and dangerous to approach at night.

Anchorage may be obtained in fine weather in 10½ fathoms about 400 yd. from the reef at its most westerly point; small schooners also use an anchorage in 9 fathoms about 100 yd. from the reef opposite a boat passage about the middle of the western side. Ships cannot enter the lagoon, but there are two boat passages on the western side. Both are narrow; the northern one is stated to have a depth of 8 ft., but the southern one appears to be most in use.

Palmerston is subject to strong winds, especially during January and February, and these are apt to assume hurricane force. In December 1883 a severe storm destroyed the coconut palms; in January 1914 houses and crops were wrecked by the hurricane which swept many islands in the region; in 1923 most of the houses were levelled and crops destroyed; at the end of March 1926 the atoll was completely devastated; in February 1931 damage was done by heavy gales; in February 1935 practically all the coconut palms and ground crops were destroyed, leaving the inhabitants dependent almost solely upon fish for food, and relief had to be sent by the New Zealand government. Until then the atoll had eight islets, but two were washed away by the hurricane. In recent years the island has recovered to a large extent from these disasters, and in 1940 there was no shortage of native foodstuffs.

Water supplies are dependent entirely upon rain catchment but are ample, owing to the erection of large concrete tanks by the administration—one of 3,000 gal.

capacity was erected in 1940. All the islets are wooded, with coconut palms, pandanus and other trees. Polynesian arrowroot is said to grow well there; breadfruit and papaya are carefully cultivated, and are in bearing; and considerable work has recently been done by the people in extending taro cultivation. In all there were five taro patches in 1940. Giant clams are found on the reef, and fish are plentiful. *Gambusia* (fish which eat mosquito larvae) flourish in the taro patches, hence recently no mosquitoes were evident, and there were few flies.

Palmerston was discovered by Captain Cook in June 1774, on his second voyage, and named after the then First Lord of the Admiralty; he also called there in 1777, on his third voyage. In 1862 William Marsters went to the island to manage it on behalf of the Tahitian trader Brander. Marsters was married to a Tongareva woman, and his descendants by her and by other Tongareva women form the basis of the present population. In recent years they have intermarried with people from Tongareva, Manihiki, Rakahanga and Aitutaki; the total population in 1940 was 59.

In 1892 Marsters was granted a lease of the island by the British government, and the present lease is made out to his descendants through the heads of the various families. The people speak a peculiar dialect of English, isolation and Polynesian admixture having evidently produced a result similar to that on Pitcairn. The settlement is on the northern part of the western islet. The London Missionary Society has a school there, subsidized by the government. Copra is the main commercial product, 25 tons having been shipped in 1940. Communication is rare; a schooner calls about once a year to bring supplies and take copra.

NIUE

Niue (lat. 19° 02′ S, long. 169° 55′ W) lies about 240 miles east of Vava'u in the Tonga group, which is the nearest land. It is a British possession, administered by the Department of Island Territories of the New Zealand government. With a total land area of about 64,200 acres, it is the largest of the islands annexed to New Zealand. The full modern name of the island, Niuefekai, is used only in songs and on formal occasions.

Physical Geography

Niue is about 40 miles in circumference, the extremes of length and breadth being about 17 miles north and south, and 11 miles east and west (Fig. 174). Its average height above sea level is about 220 ft.

Structure

In schematic form the shape of the island has been likened to that of an inverted soup plate. The whole interior is a gently undulating plateau, slightly depressed towards the centre, with no elevation of more than 25 ft. above the general surface. The edge of this plateau slopes off somewhat steeply on all sides to a lower terrace. This averages perhaps one-third of a mile in width, and slopes

gently down towards the sea, to end abruptly in most places in uneven cliffs averaging 30 ft. or so in height and deeply cut by wave action.

The island is of raised coral formation, the signs of at least two major elevations being apparent in its terraced structure. It may be

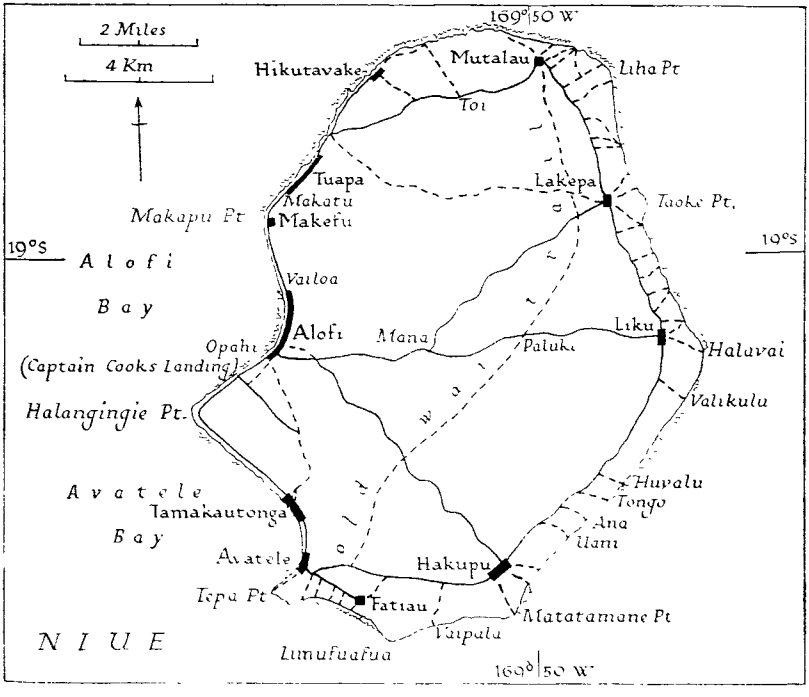


Fig. 174. Niue

The old war trail was used especially in the strife between the people of Motu, in the north, and those of Tafiti, in the south. Paluki, now deserted, was a major religious centre. Based on: (1) Admiralty chart no. 987; (2) G.S.G.S. map no. 4319; (3) E. M. Loeb, *Bernice P. Bishop Museum Bulletin*, no. 32, plate 1 (Honolulu, 1926); (4) S. P. Smith, 'Niue island and its people', *Journal of the Polynesian Society*, vol. XI, p. 80 (Wellington, 1902).

inferred that in the first great elevation an ancient atoll was raised about 130 ft., the floor of the lagoon forming what is now the interior of the island, and the reef rim of the lagoon the edge of the plateau. After a fringing reef had formed round the base the island was then raised through another 80 or 90 ft., possibly by slow degrees, thus forming the lower terrace. Coral is the only rock found on the island;

there is no trace of volcanic material. The coral rock is considerably eroded and decomposed in places. At the foot of the upper terrace or plateau—at the old shoreline—there are numerous chasms and caves; the surface of the island as a whole is strewn with grey weathered masses of coral in fantastic rugged shapes; and these are interspersed by patches of reddish soil formed as a decomposition product from the coral rock itself.

Owing to the porous character of the coral rock rain water is rapidly absorbed, and there are no streams on the island, or indeed running water of any kind. Pools of water collect in some of the caverns, often deep below the surface but usually near ground level. In most cases the water is brackish, and even in places where it is 60–70 ft. above the sea its level is affected by the tides.

Coast

The general character of the coastline is forbidding, presenting from a little distance a series of steep limestone cliffs rising from the surf, with a wall of dark green trees above (Plate 105). The island is bordered by a fringing reef about 60–80 yd. wide, broken here and there by channels which permit small boats to approach the shore. But these channels are in general mere jagged slits, offering difficult landing, and there are no beaches of any importance.

The best landing place is at Alofi, on the western side of the island, where a natural channel, artificially widened and deepened, serves ships' boats, and leads to a concrete pier. This landing place is safe during easterly winds, but from December to April the pier is often under water and sailing vessels are apt to avoid the island. Landing can also be made at Tuapa, Avatele and a few other places on the western side through less good channels. On the eastern side of the island, however, where the prevailing trade winds blow for about eight months of the year, landing is always difficult and often impossible.

The indentations of the coastline are too shallow to provide harbours for vessels. Good anchorage except in westerly winds can be found off Alofi, on the western side of the island; there is anchorage also off Avatele, though less satisfactory. At Tuapa and other villages vessels stand off and on when taking on cargo.

Climate

The prevailing winds are the east-south-east trades, which blow regularly from about April to December. From about December to

April the winds are variable from the west, north, or north-west, and storms may occur. Niue is on the edge of the hurricane belt, but such tropical cyclones are rare, occurring it is said perhaps once in ten years. A heavy storm swept the island on 2 March 1941 and caused great damage. No lives were lost, but many churches, dwellings and other buildings were unroofed, with consequent diminution of water supplies. Banana and coconut plantations were practically stripped, while other native crops were seriously affected. Poles and weights are used to hold down house roofs in heavy winds. Earthquakes are occasionally felt, but are never violent.

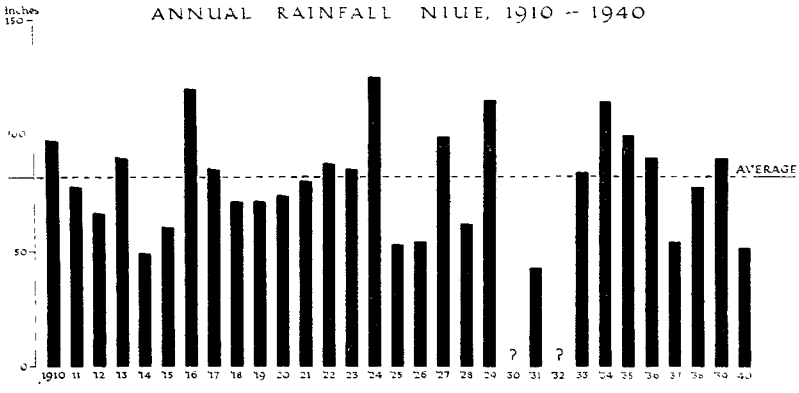


Fig. 175. Annual rainfall of Niue, 1910–40

Years for which no records are available are shown by a question mark. Based on 'Report on Niue island', *Appendix to the Journals of the House of Representatives of New Zealand*, A-3 till 1932, A-6 from 1933 (Wellington).

The range of temperature is moderate. During the whole of the year absolute maxima are normally below 95° F. and absolute minima above 55° F. Mean monthly maxima and minima are in the region of 85 and 65° F. respectively. Humidity is high, though no precise data are available. Both temperature and humidity are most trying during the period from December to April.

Rainfall is moderate, with an average precipitation of approximately 80 in. per annum during the last thirty years or so (Fig. 175). Its distribution is apt to be uneven from year to year and still more from month to month. The highest monthly fall recorded was 30·9 in. in March 1923; the lowest 0·08 in. in June 1915. The greatest fall in one day was 10·35 in. in November 1926. Most rain usually falls from December to March. Droughts are frequent. In olden

times the people suffered severely at such times from shortage of water and of food, but nowadays the effect is mitigated by a system of water storage and by European foods. Formerly the people relied upon the pools of water in the caverns and upon fresh coconuts for drinking supplies, but in modern conditions they depend primarily on rain water caught on the corrugated iron roofs of buildings. Each village has a concrete cistern fed from the church roof—the people of Niue have no scruples about drinking water obtained from churches, as those of Tonga formerly had.

Vegetation and Fauna

The soil covering of the island is scanty, consisting mainly of a red or reddish brown earth formed from greatly decomposed coral. It is often only a few inches in depth and is heavily interspersed with outcrops of surface coral rock, making cultivation difficult. The soil appears to be fairly fertile, especially perhaps on the lower terrace, and supports a thick vegetation, even amidst the coral outcrops. A great part of the island is wooded, with considerable areas of uncleared forest, through which travelling is easy owing to the absence of any very dense undergrowth. But much of the vegetation is now of secondary growth, on clearings made for cultivation in the past and now abandoned.

The flora is of varied character, and a partial list of about seventy-five species has been recorded. Large forest trees include banyan, Tahitian chestnut, *Calophyllum inophyllum* and *kafika*, the last growing to a height of 150 ft. or more with a diameter up to 4 or 5 ft. Smaller trees include candlenut, a species of *Hernandia*, *Morinda citrifolia*, several species of *Solanum*, and two kinds of gardenia. There are also coconut, fan palm, pandanus, several species of *Cordyline*, shrubs such as hibiscus, a species of *Piper* of the kava type, and many kinds of ferns and creepers. Of food plants taro (*Colocasia*) and yams (*Dioscorea*) are common, the latter in both wild and cultivated varieties; the giant taro (*Alocasia*) and sweet potato are also grown. The banana, some varieties of which have been introduced, flourishes everywhere when planted, even in the most rocky areas, and the sugar cane, also cultivated, is common and grows especially well in the more open tracts. The native arrowroot is abundant everywhere, springing up wherever the vegetation cover has been burnt. The breadfruit, probably a modern introduction, is comparatively scarce, but the papaya, introduced from Raiatea in 1831–2, is common and flourishes. In the more open parts of the island the

introduced yellow guava is abundant, and orange, lemon, shaddock, tamarind, mango, and Cape gooseberry grow well, though they are less common. The date palm has been introduced also, but it does not fruit properly. Cotton and kapok do well, and at one time the former provided a considerable item of export.

The fauna of the island is very limited. When Europeans first visited Niue the only mammals on the island were the fruit bat and the native rat, but the latter has now been driven out by the Norway rat brought on visiting vessels. Birds include a wood pigeon, a dove, a parrakeet, an owl, a martin and a swamp hen (*Porphyrio*), apart from the frigate bird and other sea birds, and migrants such as the curlew. Introduced poultry and pigs are now common. Fish are abundant, there being more than fifty edible kinds alone, but there is no great variety of shellfish. Lizards are common, but there are not many types of insects; mosquitoes are rarely seen, and the island is remarkably free from insect pests.

History

According to native tradition there were three migrations to Niue. The first cannot be placed in time, but was possibly from Samoa. The second migration consisted of a Tongan war expedition about the beginning of the sixteenth century, but the Tongan and the Niue accounts are in conflict about the results. The third migration was an expedition led by a Tongan chief of part-Niue descent, probably about the end of the seventeenth century, and resulted in his assumption of rule over the island. But other contacts of Niue with Tonga seem to have been fairly frequent, though usually of a hostile nature.

The first European discovery of Niue was made by Captain Cook in 1774. From the opposition he received on his landing he named the place Savage island, a name which is resented by the people to-day, who claim that they did not injure his crew and that their demonstration of force was to prevent the introduction of disease. It is true that subsequent landings by Europeans did result in epidemics which killed off many of the people, but this story is probably a modern rationalization. In 1830 the Rev. John Williams called in the Rarotongan-built *Messenger of Peace*, and kidnapped two Niue boys for teaching in Samoa. This and a later effort to introduce Christianity, however, were unsuccessful, and it was only with the landing of Samoan teachers in 1849 that the conversion of the people was accomplished. Their success in inducing acceptance

of the gospel was rapid, and at the same time they profoundly changed the culture of the people. By 1859 the dwellings, formerly scattered about in little strongholds in the forest, were congregated in settled villages round the school-houses; the form of the house was changed to the lath-and-plaster walled type now current; a 6 ft.-broad horse road was completed round the coast, and clothing of European type was generally worn.

The acceptance of Christianity, however, brought difficulties to the people. Hitherto whalers and other vessels had given the island a wide berth owing to the reputation of the people for savagery. But now it became a prey for exploiters of native labour. About 1862 a Peruvian slaving vessel carried off about 200 of the natives for work in the mines and other enterprises, most of them dying of disease on Sunday island, and in 1868 the notorious 'blackbirder' 'Bully' Hayes kidnapped about sixty men and thirty women from the island and sold them in Tahiti; few ever returned. From about 1865 many of the young men were recruited to work at other islands under the contract system, and in 1871 a number were taken to Malden island to work phosphate, at a rate of ten dollars per month, half paid in English money and half in trade goods,with one month's wages in advance. This became the recognized wage till at least 1900. Though in some cases, as in a few instances in Samoa, the treatment of the labourers was bad, conditions under the contract system seem to have been usually reasonable. But the effect upon the economy of the island was deleterious, owing to the large number of the most able-bodied labourers absent. In 1899 there were 561 people away on the phosphate and other islands. The wages were tempting, being estimated to be about double what could be earned by a man from the preparation of copra at home in existing conditions, and the men themselves were eager to go abroad, to the point of stowing away on vessels that called. Moreover, the chiefs had an interest in the recruiting, since they were given a commission on the number of their men who were signed on. With the coming of British administration in 1901, however, the danger was perceived, and the natives were strongly advised that by planting their unused land with coconut palms they could secure greater wealth than by extensive labour recruiting. Under the New Zealand administration the number of men permitted to leave the island to work has been limited.

In 1887 the people had appealed to Queen Victoria to be taken under British protection, and this request was repeated in 1898, and again in 1899. It was only, however, with the development of the

German plantations in Samoa that Niue was gradually discovered to have a value, and in 1900, when a British protectorate was being negotiated over Tonga, Niue was taken under British protection as part of the equivalent of Britain's surrender of claims to Samoa. In the same year British sovereignty was proclaimed, and in 1901 the island was annexed to New Zealand and placed within the boundaries of the Cook islands, in charge of a Resident Agent. In 1903, owing to the inconvenience of its distance from the rest of the Cook group, Niue was granted separate administration under a Resident Commissioner, who, however, was still answerable to the Minister for the Cook Islands. In 1932, in view of steamer communication with Western Samoa, it was held that greater administrative efficiency would be secured by making the Resident Commissioner responsible to the Minister for External Affairs, who was in charge of the mandate for Samoa. In 1943, responsibility passed to the Minister of Island Territories.

The People

Population

The population consists almost entirely of natives of Niue; recent figures for the number of Europeans, mixed bloods and natives of other Pacific islands are not available, but the proportion is probably considerably less than 2 % of the total people on the island. There are normally about twenty Europeans, including government officials, missionaries and merchants or traders. The descendants of a European trader and his Niue wife occupy important positions in the commerce of the island. The total estimated native population at 31 December 1940 was 4,424, of whom 2,188 were males and 2,236 were females.

In the past the Niue people suffered in the same way as those of most other Pacific islands; after the early years of European contact the population began to decline. The estimates by missionaries may not be wholly reliable, but their trend is significant. The following table indicates the position from 1875 to 1936, the date of the last census (the figures for 1875 and 1899 are estimates; the others are official census figures):

Year	Population	Year	Population
1875	5,080	1916	3,880
1899	4,576	1921	3,750
1901	4,079	1926	3,795
1906	3,822	1936	4,104
1911	3,942		

The lowest point was reached in 1921, after the influenza epidemic, and from then onwards not only have the gross population figures increased, but the excess of the birth-rate over the death-rate has tended to widen progressively. While in 1922 the birth-rate was only 26·2 per thousand as against a death-rate of 21·7 per thousand, the corresponding rates per thousand for the years 1938 to 1940 were 36·1 and 21·1; 34·6 and 18·0; 34·1 and 14·1. The reason for this appears to be the improvement in the health of the people by campaigns against gonorrhea and other diseases, and the trend to increase would seem to be fairly firmly established.

Physical Type

Few systematic observations of the physical appearance of the Niue people have been made. They belong to the Polynesian group, with light brown skins, dark eyes, dark straight or wavy hair, and tall stature, but their precise relations to other members of the group have not been determined. In general their features are regular, with nose not so broad and lips less thick than in the case of some other Polynesian peoples. But there is considerable variation in physical type. A few of the people have brown, reddish tinted hair —an old Polynesian trait not the result of European intermixture— and with some the hair is in small crisp curls or of a bushy frizzly character. Baldness is seen occasionally. Facial hair of the men is not thick, but in former times beards were worn.

It has been stated that there is a distinct difference in physical type between the people of Motu, the northern part of the island, and those of Tafiti, the southern part of the island, the latter being shorter, and broader, with large wide jaws, a low forehead and a generally more morose expression. These differences are attributed to the result of separate immigrations into the island, and comparative isolation through hostility and disapproval of intermarriage between members of the two areas. Information is too slight, however, to enable these differences to be established with any certainty, and the impressions of them may not be accurate.

Language

The language of the people of Niue bears a fairly close relationship to the Tongan and Samoan dialects of western Polynesia. Among its more characteristic features in vocabulary is the omission of the *r* in many words of which it forms an integral part in other dialects.

For example, *rakau* (tree) in most Polynesian dialects becomes *akau* in Niue, and *marama* (light) becomes *maama*. And in pronunciation a *t* followed by *i* or *e* tends to have a sibilant sound, like *ts*. Other features which differentiate it from many Polynesian dialects are the absence of plural forms of the possessive pronouns, and the infrequent use of the so-called passive forms of verbs. In modern writing the *ng* sound is represented by *g* only, a usage due to the Samoan mission teachers.

To a small extent there was formerly a 'chief's language'. Thus, whereas the expression for the face of an ordinary person was the common word *mata*, that for the face of a chief was *fufunga*.

Culture

In former times the houses of the people were constructed on a timber framework, with many side poles, curved rafters, a roof of sugar-cane leaf thatch, and blinds of coconut leaves hanging down the open walls. This style was changed at the instance of the Samoan mission teachers, who introduced houses with walls of wooden planks or of lath and plaster, using coral lime. Most of the modern houses are still roofed with thatch of pandanus or sugar-cane leaf, but those of wealthy families have roofs of corrugated iron. Some of these more elaborate houses are put up primarily for show, the family often sleeping in a cruder dwelling house in the rear. The floor is of crushed coral over which mats are laid, and house furniture is simple.

The dwellings of the people are grouped in villages around the coastal area, those on the western side being on the lower terrace and those of the eastern side on the upper terrace. For long there were eleven villages, but recently their number has increased to thirteen. The interior of the island is uninhabited. A Niue village occupies a considerable space, the houses being often set in enclosures dotted with flowering plants or shrubs. In each village there is a substantial lath-and-plaster or stone church, a schoolhouse and the teacher's residence, and a grassy open space for public assembly and village cricket.

Social Organization. The social organization is simple by Polynesian standards, lacking the highly differentiated system of rank and government which obtains in the larger neighbouring communities of Tonga and Samoa. It has been described as democratic and republican, and though these terms are too precise they do convey some idea of the lack of strong class distinction which characterized the culture even in former times.

Niue society is not organized on the basis of tribes, but of large kinship groups each tracing descent from a common ancestor. It is said that every village was first settled by the members of one family, and though now no village retains this purely family character many of its members are often closely related by kinship. Membership of a kinship group, carrying with it the title to land, is patrilineal, that is, traced through the father's line, and the father's sister is a person of great importance. Authority in the group is usually exercised by the eldest brother, though this has tended to fall into disuse at the present time with the more distinct emergence of individual rights to property. Genealogical records, running back five to seven generations, are kept by the heads of kinship groups because of their value in settling property claims, particularly to land.

In olden times, marriages were normally arranged by the two kinship groups concerned, and celebrated by an exchange of feasts. Nowadays the feasts are still held, but the union is decided by the man and woman concerned. The people do not regard marriage as necessarily involving a religious rite, and many unions begin by the couple living together. Since this is an offence under the law, they are served by the police with a notice to marry within a given time limit or else each pay a fine. The marriage is normally performed by the Resident Commissioner and not by the church officials. Divorce is granted under the law, but the number of divorces is small. In former times polygyny was common among the chiefs and important warriors, but strict monogamy is now the rule.

As in all Polynesian communities, the position of women in Niue was and is high. The men share with them the work of cultivation and of cooking, and in family conclaves their influence is considerable; in former times they often took a prominent part in encouraging their menfolk in battle.

Rank. The system of rank in Niue in pre-European times is obscure. Chieftainship existed, apparently evolved on the basis of headship of kinship groups combined with prowess in war, and the chiefs had certain privileges such as rights to the first fruits of crops, and to specific marks of respect from the common people. As recently as 1900 no ordinary person could approach a chief or pass before him without stooping in a humble attitude, and all requests to a chief were made sitting cross-legged. Great prestige was enjoyed by noted warriors, and by forcefulness of character, strength and ability a common man could apparently rise to a position of considerable power. There seems also to have been a class of servants, though their

position may have been voluntarily assumed; if a man had insufficient land of his own he might ally himself with a powerful warrior and exchange his manual labour for protection and a temporary land grant. But there was no rigid system of grouping according to crafts and occupations, and even the chiefs seem to have held their position not simply by hereditary right but by the exercise of ability as well; a lazy or inept eldest son of a chief might lose his rank through lack of support and respect from his people.

Niue has never been characterized by a unified strong political authority. At various times the island possessed a king (*patuiki*) but the office was not hereditary but elective, and in periods when there was no holder of the title the government was carried on by a council of chiefs, without radical change. It appears that the concept of kingship was introduced only about the beginning of the eighteenth century, by a Tongan conqueror, and in practice the king tended to be a figure-head set up by the war party in power at that time. His fate was often a violent death at the hands of the opposition, so that it became increasingly difficult to secure a candidate for the office, which finally fell into abeyance about the end of the eighteenth century. In this old system the king was believed to have power over the weather and the growth of crops; that is, his functions were more religious than political. In 1875 the institution of kings was revived, a chief of good repute being elected by the people, and anointed at a 'coronation seat' of coral rock at Alofi. The third holder of this renewed office died in 1917, and the institution was then allowed to lapse. At the present day practically the entirely native system of rank and government has disappeared; not only is there no king, but there are no chiefs, and the ceremonies of obeisance no longer operate.

Land Tenure. Practically all the land of Niue is still owned by the natives, on a family or kinship group basis, with the head of the family having the controlling voice in its administration. Individual ownership exists to some extent, titles being acquired by occupancy and cultivation, and by inheritance, but such land may not be transferred to others outside the kinship group, and in default of immediate heirs it reverts to the head of the group for assignment to other members. A provision incorporated into the law from the code which was in force before the island came under British administration prohibits the sale of land to foreigners. Disputes over land have been common in the past between kinship groups, and at the beginning of the present century there were many attempts to establish rights to land by planting coconut palms and other fruit trees. But trees can

also be owned separately from the land on which they stand. Fishing grounds tend to be regarded to some extent as family property, especially where a pool has been stocked with fish.

Agriculture and Fishing. In agriculture the people show great industry, producing an abundance of food and utilizing even small patches of soil among the coral rock. The cultivations are generally situated at some distance from the villages, in newly cleared land in the interior of the island, and a great part of the day is spent there. Though the total area of the island is some 10 sq. miles it has been estimated that owing to its rocky surface and the temporary working out of many tilled areas only about one-eighth of the land, that is, about 2 acres per head of the population, is available for cultivation at any one time. Because of the thin soil covering and the many outcrops of coral rock considerable labour is needed in growing food supplies. The traditional practice of burning rather than composting all vegetable rubbish has probably tended to increase the difficulty. Recently, however, practical instruction has been given to schoolboys at the administration plantation, to improve the native agricultural technique. The main plants cultivated are taro, banana, sweet potato and coconut, while pigs and poultry are reared and form the main meat supply. Animals are imported to improve the stock; in 1938, for instance, pigs, cattle, fowls, geese and pea-fowls were thus introduced.

Fishing is carried on mainly by the younger men; the older men and the women work the plantations, exchanging taro and yams with their kinsfolk for fish. Women, however, take shell-fish and crabs on the reef. Bonito are caught in February from canoes at sea with a pearl-shell hook, a method introduced from Samoa. The taking of squid by means of a lure was copied from the same source. An iron-pronged fish spear is used for reef work. Flying fish are taken with a long-handled dip-net used in conjunction with a torch at night.

Canoes. The Niue canoe is of the single outrigger type, with indirect attachment of booms to float. Washstrakes and bow and stern covers are added to a dug-out hull. The craft are paddled, and sails do not seem to be used. The normal crew is four men, though formerly six-seated craft were also built. According to tradition the Niue men were in the habit of making voyages to Tonga and Samoa in these craft.

Ancient Warfare. Formerly the people of Niue lived in a state of almost incessant warfare, in most cases the opposing parties being representatives of the north and the south ends of the island. The

acquisition of land was one of the most powerful incentives to this, and the lack of any effective central authority allowed the continuance of regular blood feuds between individual families and villages. Spears, clubs and throwing stones were the principal weapons, a local development being a special type of cleaving club with a sharp edge. Frequent use was made of forts, naturally protected places among the coral rocks, which were unsuitable to withstand a siege because of the lack of water, but which served as strongholds in battle. The actual fighting was commonly done by single combat and not by troops. As with other Polynesian peoples in war, there were definite rites and conventions to which both sides conformed. Treachery, however, was not uncommon. Warfare was abolished about the middle of the nineteenth century owing to the influence of the mission teachers, and the peace then established has been kept ever since. Village rivalry, which still exists, receives its outlet on the cricket field.

Religion. In olden times, the chief god of the people was Tangaloa, identified with the rainbow, and in addition there was a large number of village and other lesser deities, and ancestral spirits. Some species of animals and plants were regarded as being the incarnation or residence of some of these deities, and were therefore respected, in a manner akin to totems. There was no organized priesthood, and the head of a family officiated in matters affecting his group. Certain individuals, however, were regarded as being spirit mediums, or 'anchors of the gods'.

The Niue people of to-day are all Christian and practically all adherents of the London Missionary Society. With Christianity, however, a ghost cult has developed owing to the beliefs of the Samoan mission teachers, and the spirit mediums are now regarded as being possessed by ghosts of the dead. Until recent years they were consulted in cases of sickness, often in preference to the government doctor. The system of taboo was formerly important, and taboos are still used for the protection of private property.

Administration

Niue is administered through a Resident Commissioner at Alofi, which is the seat of government and the port of entry. Each of the thirteen villages elects a member to an Island Council, which assists the Resident Commissioner in his duties, and chiefs being lacking, the councillors provide the usual channel between the Resident

Commissioner and the people. The Resident Commissioner, who is also Judge of the High Court and Judge of the Native Land Court, is assisted by a Deputy Resident Commissioner, who is also Registrar of Courts and Officer in charge of Police.

The laws are the same as those of the Cook islands, in virtue of a consolidating Act of 1915. The people of Niue are law-abiding, and serious offences are rare. Adultery, petty theft, permitting animals to wander, assault without intent to kill, are among the commoner forms of offence. In 1940–1 about 1,500 cases were dealt with, nearly all by the High Court; only sixteen cases came before the Civil Court, nine before the Juvenile Court, and twenty-three before the Native Land Court.

There is a small native police force under the control of a European official. In 1901 there were twenty-three magistrates and 125 police, who were paid by appropriating the fines to themselves. This dangerous position was rectified by the first Government Resident, who reduced the magistrates to five and the police to eleven, and arranged that they should be paid by the administration.

The land policy of the government, as in the Cook islands, is designed to promote the development of the land by the people themselves, and it is not easy for foreigners to acquire land on the island.

Financially the island has tended on the whole to be nearly self-supporting, though this condition has depended primarily on the maintenance of its export trade, particularly in copra and bananas. In recent years, however, serious deficits have occurred, amounting in 1939–40 to over £6,000, which was met from the Reserve Fund, and in 1940–1 to over £1,000, a reduction which was due only to a subsidy of £5,000 from the New Zealand government. Expenditure now amounts to about £12,000 per annum, major items being on account of health, education and public works, including the improvement of roads and the construction of concrete cisterns. Ordinary revenue is obtained largely from customs duties, an export duty on copra, the sale of stamps, and a tax of 10*s*. per head per annum on all males over 18 years of age. The customs tariff, with minor exceptions, is the same as that of New Zealand.

Social Services

Medical work in Niue is carried on by the government under the control of the Chief Medical Officer, a European. The first Government Medical Officer arrived in the island in 1911, and in the inter-

vening thirty years medical facilities have been expanded. They now include a government hospital at Tufukia (opened in 1922) with a European matron and five Niue nurses, and free medical treatment for the people at the hospital and in their villages, which are normally visited weekly by the medical authorities. In addition, a house-to-house inspection of all villages is carried out annually, and all the schools are visited. In 1940–1 two Niue youths were undergoing training in the dental clinic at Apia, and a student was sent to the Central Medical School at Suva, Fiji, for training as a native medical practitioner. During the three years 1938–41 the government expended annually approximately £2,700 on the medical department, an average of about 12*s.* 6*d.* per head of population. The general health of the people of Niue is good. But yaws is prevalent, and conjunctivitis, ringworm and filariasis are fairly common.

Education is carried on by both the government and the London Missionary Society, in co-operation. There are three administration schools, one opened in 1909 near Alofi, another in 1920 near Hakupu, and the third in 1939 at Mutalau, and the natives have asked for further administration schools in other villages. There are nine mission schools in the other villages. All the schools together have a total roll strength of nearly 1,000 pupils, of whom rather more than one-half attend the administration schools, and the attendance averages about 90 %. The administration expends about £2,000 per annum on education, this usually including a subsidy of £500 to the London Missionary Society to assist them in their school work.

Economics

The economic resources of Niue are almost wholly agricultural. There are no minerals on the island and much of the forest area is difficult of access for milling timber. In the absence of important secondary industries and (with the decline of the labour trade) of any large avenues of paid employment, the people depend almost completely on the produce of their plantations. The preparation of copra was for many years the major occupation apart from food production. Copra first began to be manufactured in Niue in 1877, and by 1900 the average export was about 350 tons per annum, yielding at the prices then current an income of rather more than £3,000 a year to the islanders. The traders paid the producers at the rate of 1*s.* per 10 lb. of copra, but in trade goods, not in money. Prior to the copra period the people of Niue received a small income

from growing cotton, which in the years after the American Civil War fetched high prices. The export from the island was never large, but increased till 1880, when the price fell so heavily that its cultiva-

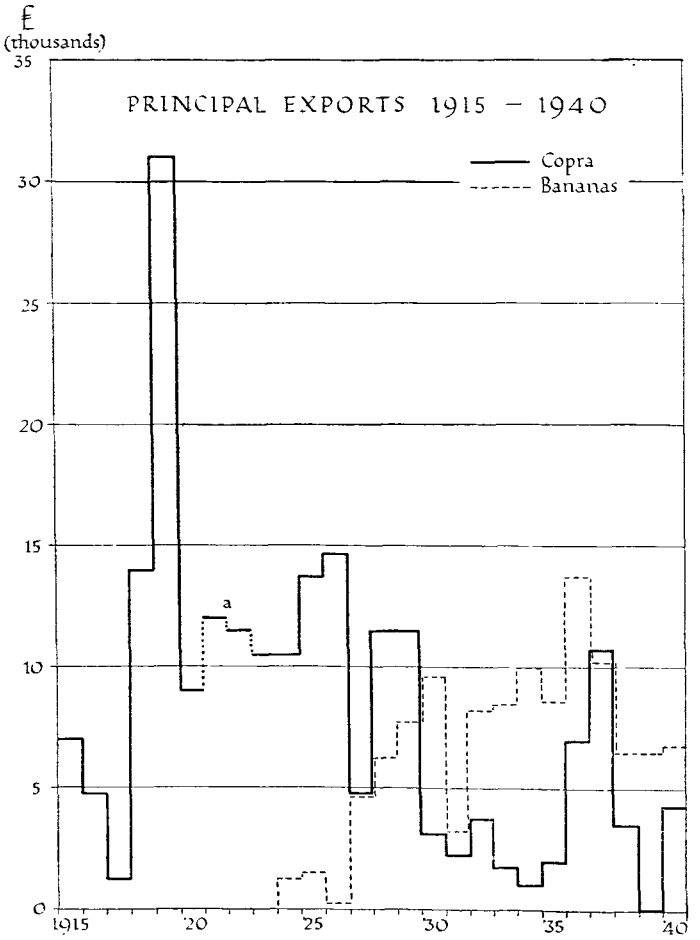


Fig. 176. Value of principal exports from Niue, 1915–40

a indicates estimated values for 1921 and 1922. Based on the same sources as Fig. 175.

tion was abandoned. In the last twenty years or so the growing of bananas has become an important industry, seconded since about 1930 by that of sweet potatoes. The people of Niue have long been noted for their plaited baskets and hats, made by the women from

pandanus, and from a similar leaf imported from Aniwa in the New Hebrides. The market for these products is very variable, but at times provides an important source of income.

The economy of the island is dependent to a large extent upon external trade. For the decade 1931–40 the average annual value of exports, in round figures, was £16,000, and that of imports £17,400. In general, the value of annual imports is slightly in excess of that of exports, though the position was reversed in 1940, the first time since 1929. Trade, both in quantity and in value, is apt to fluctuate greatly from year to year, partly owing to weather conditions on the island, but primarily to variations in world markets (Fig. 176). The lowest total export value of recent years was in 1931, when the island was just recovering from drought and storms. The effects of the boom period in copra after the last war are seen in 1919, when the record figure of £35,000 in exports was reached. Niue is in a better position than many Pacific islands in that the export of bananas tends to some extent to cushion the worst effects of a heavy fall in the price of copra. This was demonstrated in the economic depression after 1932. Though in 1934 the export of copra fell to 125 tons, of a value of less than £1,000—less than a quarter of the average export—that of bananas was even slightly increased, thus maintaining the level of total export values to some degree. Much the same happened after the outbreak of the present war. The export of plaited baskets also, which after 1929 had fallen to a value of only a few hundred pounds per annum, rose in 1939 (when no copra was exported) to £1,500, and in 1940 to the phenomenal height of over £7,000.

By far the largest amount of the Niue trade goes to New Zealand, which during the period 1931–40 took about 70 % of the island's exports, and supplied about 80 % of its imports. The United Kingdom and Australia are the other main suppliers. Cloth, food (especially meat), timber, tobacco, motor vehicles and motor fuel, and lighting oil are the principal imports.

Communications

Niue does not lie on any major trade or passenger route. Overseas communication depends largely on the New Zealand government's motor-vessel *Maui Pomare*, which calls approximately once a month, and is the mainstay for the trade of the island. A vessel of the London Missionary Society also calls annually, and an auxiliary schooner from Apia (Western Samoa) visits the island about three times a year.

Interior communications consist of a road system of rather more than 35 miles, encircling the island. The roads were originally constructed under the influence of Samoan mission teachers, from about 1850 onwards, but were taken over by the administration, and in recent years have been improved to take trucks and other motor vehicles. In 1939 the administration had five trucks, four trailers and four cars in operation.

There is no telegraph or telephone service on the island. There is a W/T station, under the control of a European officer, assisted by a Niue operator. The plant is not an up-to-date one, but daily communication is maintained with Apia and Wellington.

BIBLIOGRAPHICAL NOTE

Brief general accounts of the islands discussed in this chapter are contained in: Foreign Office *Peace Handbooks*, vol. XXII, No. 144 (London, 1920); *The New Zealand Official Year-Book* (Wellington, 1942—does not include Swains island); *The Pacific Islands Year-Book* (Sydney, 1939; also wartime edition, 1942); *Pacific Islands Pilot*, vol. II (6th ed. 1932), vol. III (6th ed. 1931), with supplements.

A comprehensive account of the Tokelau group and Swains island, with an exhaustive description of the culture of the native people, is given by G. Macgregor, 'Ethnology of Tokelau islands', *Bernice P. Bishop Museum Bulletin*, no. 146 (Honolulu, 1937), and a more recent description of the salient features by E. H. Bryan Jr., *American Polynesia*, pp. 84–99 (Honolulu, 1941). Other useful older sources are: J. J. Lister, 'Notes on the natives of Fakaofu (Bowditch Island) Union Group', *Journal of the Royal Anthropological Institute*, vol. XXI, pp. 43–63 (London, 1891); S. Percy Smith, 'A note on the Tokelau or Union Group', *Journal of the Polynesian Society*, vol. XXXI, pp. 91–3 (New Plymouth, 1922); W. Burrows, 'Some notes and legends of a South Sea island', *Journal of the Polynesian Society*, vol. XXXII, pp. 143–73 (New Plymouth, 1923); F. W. O'Connor, 'Researches in the Western Pacific', *Research Memoirs of the London School of Tropical Medicine*, vol. IV, pp. 42–5 (London, 1925); 'Report of the Administrator of Samoa to the Government of New Zealand on the Tokelau (Union) islands', *Appendix to the Journals of the House of Representatives of New Zealand*, Reports, 4D (Wellington, 1926)—not continued in subsequent years.

For the Cook islands valuable statistical and general information is given in the annual 'Report of the Cook Islands Administration', *Appendix to the Journals of the House of Representatives of New Zealand*, A3 (Wellington). A short account of the islands of the Northern Cook group is given by E. H. Bryan Jr., *American Polynesia*, pp. 108–35 (Honolulu, 1941). Aspects of the physical geography are dealt with by P. Marshall, 'Geology of Mangaia', *Bernice P. Bishop Museum Bulletin*, no. 36 (Honolulu, 1927); P. Marshall, 'Geology of Rarotonga and Atiu', *Bernice P. Bishop Museum Bulletin*, no. 72 (Honolulu, 1930); G. P. Wilder, 'Flora of Rarotonga', *Bernice P. Bishop Museum, Bulletin*, no. 86 (Honolulu, 1931); A. Murray Linton, 'Vegetation on Manihiki and Penrhyn', *Journal of the Polynesian Society*, vol. XLII, pp. 300–7 (Wellington, 1933); T. F. Cheeseman, 'The flora of Rarotonga', *Transactions of the Linnean Society—Botany*, vol. VI, pp. 261–313 (London, 1903). A series of interesting zoological and botanical notes are given by W. Wyatt Gill, *Jottings from the Pacific*, pp. 125–210 (London, 1885).

The life of the native people is described in detail by: P. H. Buck, 'The material culture of the Cook islands (Aitutaki)', *Board of Maori Ethnological Research Memoirs*, vol. I (New Plymouth, 1926); Te Rangi Hiroa (P. H. Buck), 'Ethnology of Tongareva', *Bernice P. Bishop Museum Bulletin*, no. 92 (Honolulu, 1932); Te Rangi Hiroa (P. H. Buck), 'Ethnology of Manihiki and Rakahanga', *Bernice P. Bishop Museum Bulletin*, no. 99 (Honolulu, 1932); Te Rangi Hiroa (P. H. Buck), 'Mangaian Society', *Bernice P. Bishop Museum Bulletin*, no. 122 (Honolulu, 1934); Ernest and Pearl Beaglehole, 'Ethnology of Pukapuka', *Bernice P. Bishop Museum Bulletin*, no. 150 (Honolulu, 1938). One of the classic sources of information about Polynesian beliefs and 'oral literature' in pre-European times is W. Wyatt Gill, *Myths and Songs from the South Pacific* (London, 1876); this deals mainly with Mangaia. The physical anthropology is dealt with by H. L. Schapiro and P. H. Buck, 'Physical characters of the Cook islanders', *Bernice P. Bishop Museum Memoir*, vol. XII, no. I (Honolulu, 1936). Social services, apart from the current information given in the annual government reports, are examined specifically by S. M. Lambert, *Health Survey of the Cook Islands* (Wellington, 1926); Patrick Jackson (editor), *The Maori and Education*, pp. 357–89 (Wellington, 1931).

The most complete recent account of Niue and especially of its people is given by E. M. Loeb, 'History and traditions of Niue', *Bernice P. Bishop Museum Bulletin*, no. 32 (Honolulu, 1926). The progress of the island from year to year is described in the annual 'Report on the Niue Island Administration', *Appendix to the Journals of the House of Representatives of New Zealand* (Wellington); this was contained in Appendix A–3, 'Cook and other islands', till 1932; after that date it has continued separately as Appendix A–6. Two accounts which describe the island in some detail, with conditions as they were some forty years ago, are: B. Thomson, *Savage Island* (London, 1902); S. Percy Smith, 'Niue island and its people', *Journal of the Polynesian Society*, vol. XI, pp. 80–106, 163–78, 195–218; vol. XII, pp. 1–31, 85–119 (Wellington, 1902–3). An account of some aspects of former Niue religion is given by E. M. Loeb, 'The Shaman of Niue', *The American Anthropologist*, vol. XXVI, pp. 393–402 (Menasha, 1924). Linguistic material is given by E. Tregear and S. Percy Smith, *The Vocabulary and Grammar of the Niue Dialect of the Polynesian Language* (Wellington, 1907).

For maps see Appendix I.

Chapter XIII

GENERAL REVIEW OF THE SAMOA GROUP

Physical Geography: History: Growth and Distribution of Population: People

The Samoa group consists of a chain of islands stretching approximately from lat. 14° 32′ S, long. 168° 08′ W to lat. 13° 30′ S, long. 172° 50′ W (Fig. 177). From east to west they are: Rose atoll, with a land area of about 0·05 sq. mile; the Manu'a group, comprising Ta'u, Olosenga and Ofu, with areas of 19·1, 0·6 and 1·8 sq. miles

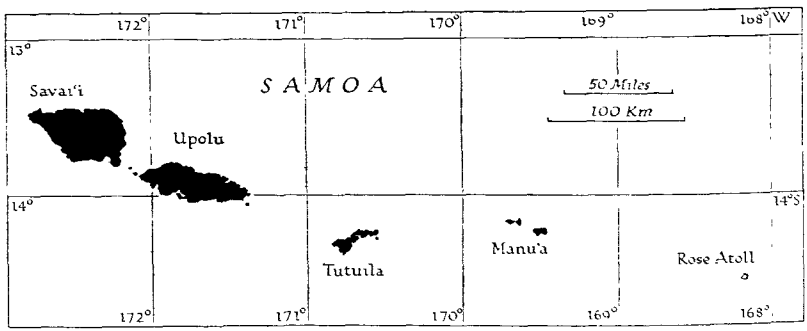


Fig. 177. The Samoa group

Based on Admiralty charts nos. 780, 1730.

respectively; Tutuila, 49·6 sq. miles; Upolu (including the islets of Fanuatapu, Namua, Nu'utele, Nu'ulua and Nu'usafe), 400 sq. miles; Manono, Apolima and Savai'i, 700 sq. miles. Tutuila and the islands east of it are administered by the United States, and are known as American Samoa. The islands west of Tutuila are administered by New Zealand under mandate from the League of Nations and are known as the Territory of Western Samoa.

PHYSICAL GEOGRAPHY

Structure

Little is known about the geology of these islands. The whole group is built up on a submarine ridge separated from neighbouring groups by depths of at least 2,500 fathoms. Further, the islands themselves can be divided into four groups separated from each other by channels or stretches of sea of considerable depths. The large islands

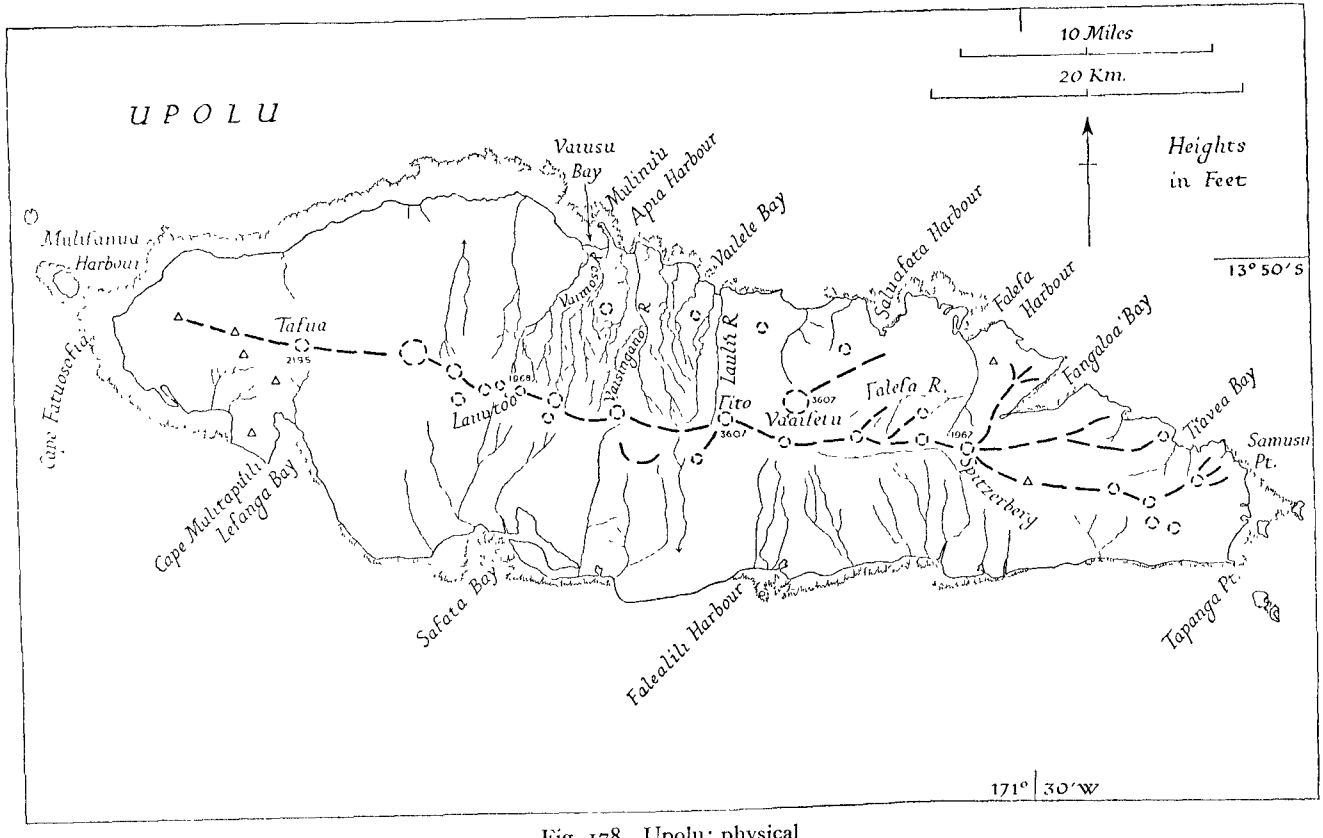


Fig. 178. Upolu: physical

Based on: (1) Admiralty chart no. 1730; (2) Lands and Survey Department, Samoa, map no. 1; (3) G.S.G.S. map no. 4299; (4) map in *Appendix to the Journals of the House of Representatives of New Zealand*, A–4 (Wellington, 1936).

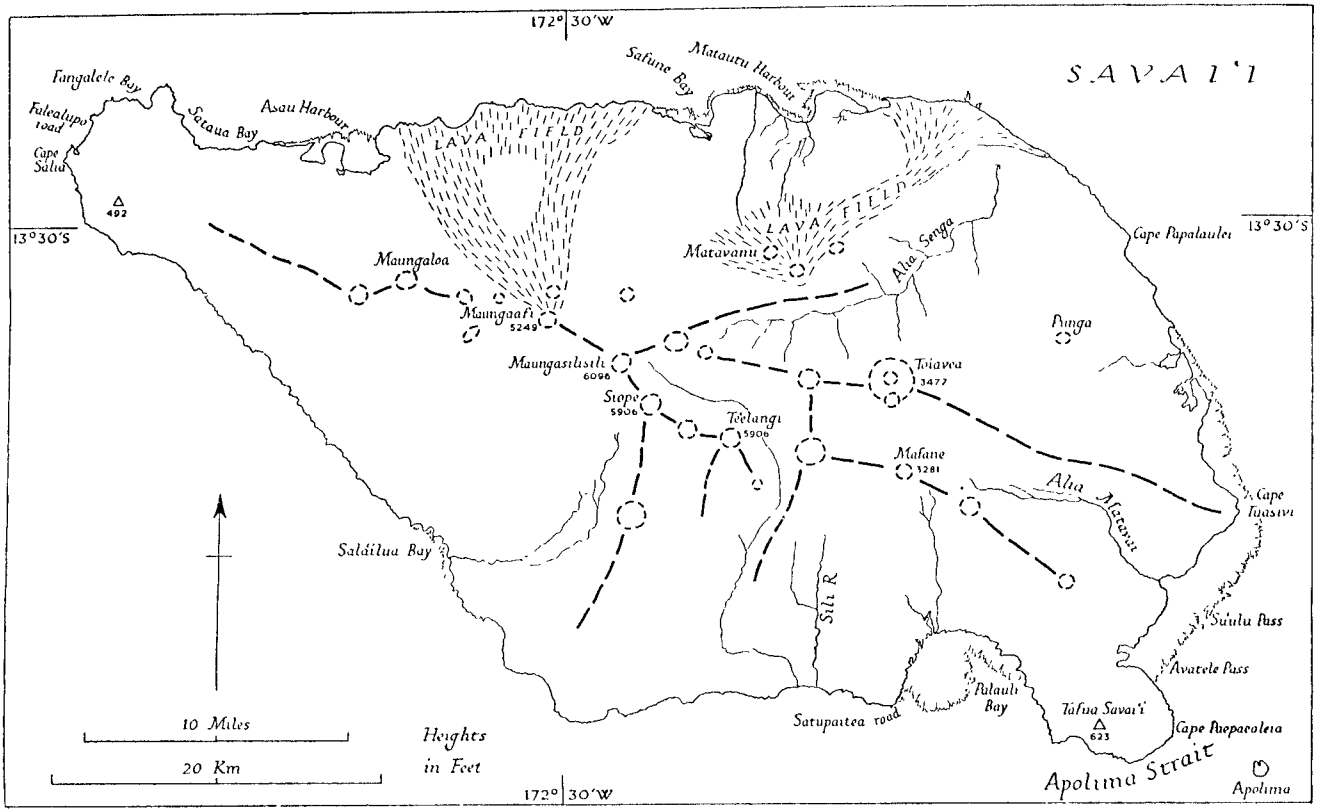


Fig. 179. Savai'i: physical

Based on: (1) Admiralty chart no. 1730; (2) U.S.H.O. chart no. 2921; (3) Lands and Survey Department, Samoa, map no 2; (4) G.S.G.S. map no. 4299; (5) map in *Appendix to the Journals of the House of Representatives of New Zealand*, A 4 (Wellington, 1936).

of Savai'i and Upolu are separated from Tutuila by a passage 44 miles wide and nearly 2,000 fathoms deep. Tutuila is separated from the three islets of Ta'u, Ofu and Olosenga by a distance of 40 miles and a depth of rather more than 800 fathoms. They in turn are separated from the isolated Rose atoll about 80 miles eastward by a depth of 800 fathoms or more. The Samoa islands may therefore be regarded as the tops of a single mountain chain. With the exception of Rose atoll they are all high islands of volcanic formation.

There is some similarity between the geological history of Samoa and that of Hawaii. Tutuila shows a state of erosion analogous to that of Oahu. Upolu, with its clearly defined craters (Fig. 178) and

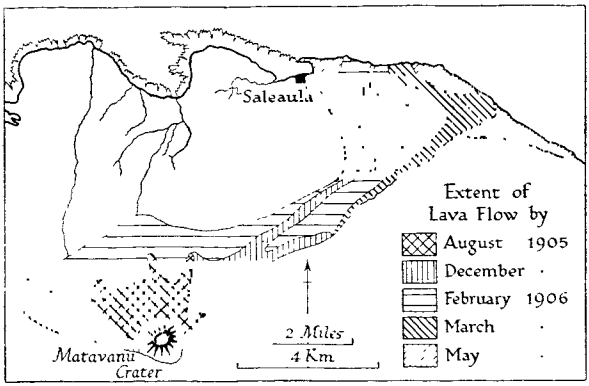


Fig. 180. Lava flows from Matavanu crater, 1905–6

The extent of the lava flows at successive periods is indicated, after the eruption beginning 4 August 1905. Based on Tempest Anderson, 'The volcano of Matavanu in Savai'i', *The Quarterly Journal of the Geological Society of London*, vol. LXVI, p. 622 (London, 1910).

greater erosion at the eastern end, is comparable to Maui, while Savai'i is similar in formation to the island of Hawaii (Fig. 179). In fact the profile of Savai'i seen from the sea is not unlike that of Mauna Loa in Hawaii.

While little is known about the actual periods of the eruptions, the evidence of erosion would suggest that volcanic activity ran through the chain from east to west. Starting with the submarine volcano which forms the foundation for Rose atoll, it ended with the large island of Savai'i, where an eruption of Matavanu occurred in 1905 and continued intermittently till 1910. In the course of this eruption the lava flow reached the sea, enveloping about 9 miles of coast and covering a considerable area (Fig. 180).

Ranges of hills running east and west form the backbone of each of the three principal islands. Except in Tutuila, where more erosion has taken place, extinct craters are situated along these ranges only a few miles apart. This arrangement of the craters suggests that the line of islands marks the position of a long fissure in the ocean floor, through which at scattered points and intermittently over a long period volcanic material has been extruded. In Tutuila (Fig. 203), where no craters recognizable as such remain, it is possible that Pango Pango harbour may have been formed from a gigantic broken-down crater. The lava from these craters, which forms the mountains and indeed the rock of the greater part of the islands, is a coarse vesicular basalt. Spurs or ridges formed by old lava flows branch off from the craters to the sea. Their slope is usually gentle, varying from 5 to 10°. Round the shores a flat belt of coral debris has been built up. In places this belt has been covered by lava flows which have run out into the sea forming low headlands.

Lakes and Rivers

In some craters, notably Pule in Savai'i and Lanuto'o in Upolu, deep lakes have formed. In the latter, for some reason not yet explained, the water level remains more or less constant throughout the year. The crater is of considerable age and the sides are covered with dense vegetation. A small crater behind Safune bay is fed by a stream passing over a waterfall. The rocks of many craters are, however, too porous to hold water. A characteristic of Samoan streams is that they have more water near their sources than near the sea, and some streams do not reach the sea above ground at all. This is due to the porous nature of the coarse basalt rocks. Water makes its way through the fissures into the lava and may run off through the tunnels which were originally formed by the draining off of hot lava beneath the cooled and solidified crust. Parts of northern Upolu are characterized by deep-cut hanging valleys and waterfalls similar to those in the Kohala district of Hawaii. Rivers on the south sides of the western islands of the group, where they are more frequent, tend to spread out to some width, but they are shallow and easily fordable. In Savai'i the principal streams on the south coast are the Sili river and the Faleata, and on the east coast the Alia Senga, the lower course of which is generally dry. In Upolu fair numbers of small streams, chief of which is the Vaisingano, flow from the north side



Plate 112. Entrance to Pango Pango harbour, Tutuila

The view is from within the harbour, on the west side.



Plate 113. Shores of Pango Pango harbour

Behind a narrow fringe of cultivated low land rise steep forest-clad hills. The road is on the left.



Plate 114. Forest in the mountains of Upolu

On the slope of Lanuto'o, at a height of about 2,000 ft. There is a thick growth of tree ferns, while climbing *Freycinetia* (with narrow leaves) and *Rhaphidophora* (with broad leaves) cover many tree trunks.



Plate 115. A deep valley on the north coast of Tutuila

Looking down into the head of Fangasa bay from the top of a track over the hills to Pango Pango. Owing to the rugged nature of the country there are no formed roads in this region.

of the watershed. In Tutuila, where most of the streams are short, few reach the sea.

Coasts

(Plates 110–113, 115)

Coral reefs, mostly of the fringing type but occasionally of barrier form, with lagoons behind, suitable for seaplanes or small craft, occur round the three largest islands. But in Savai'i owing to the more recent formation of the island the coral is not so well developed. At numerous points on all coasts there are passages through the reef where the outfall of fresh water has inhibited the growth of coral. The beaches behind these openings are exposed to heavy surf.

Immediately behind the shore is a belt of flat land, either of coral sand or of alluvial deposits. Occasional patches of mangrove swamp occur. The belt of flat land varies in width from a very narrow strip in parts of Tutuila, scarcely large enough to provide space for a village, to large areas on the north of Upolu. The coastal flat is not continuous, owing to the headlands formed by flows of lava. These headlands may be high or low, but in either case they are very rugged and travel across them is difficult. Long stretches of such coast, known as iron-bound coast, are characteristic.

Passes in the barrier reef on the north of Upolu and to a lesser extent on the east of Savai'i lead to numerous anchorages. Some like Saluafata are very well protected and could be developed into useful ports were trade to warrant expenditure for improvements. In Savai'i most of the bays suitable for anchorages are fairly shallow, and reefs, usually with passages through them, either fringe the shore or stretch across their mouths. Tutuila, in spite of a comparative absence of large reefs, has few good anchorages apart from the very fine harbour of Pango Pango. The only ports in the group are Apia on Upolu and Pango Pango in Tutuila (pp. 655, 657).

Climate

Situated about lat. 14° S and with the nearest large islands, the Tonga group, about three hundred miles away, Samoa has a purely oceanic climate unaffected by neighbouring land masses. But the south-east trades tend to be locally deflected by the mountain masses of the larger islands and blow from a more or less easterly direction parallel to the north and south coasts.

The following figures and description are based, unless otherwise stated, on data from the meteorological station at Apia, 1890–1920.

Barometric pressure varies from 1008 mb. in January to 1012 mb. in July, August and September. There is a semi-diurnal variation of about 1·5 mb. with maxima at 0900 hr. and 2200 hr., minima at 0700 hr. and 1900 hr. The pressure dip during thunderstorms is extraordinarily small and can be recorded only with a special photographic recording barograph.

For eight months, April to November, the dominant winds are the south-east trades. In the 'wet season' from December to March, the trades are interrupted by northerly and westerly winds. Hurricanes which blow occasionally from January to March are liable to do considerable damage to crops and structures generally. They start by blowing from the east and then back through north to south-west.

The trade-wind layer extends upwards to an altitude of about 6000 ft., blowing with an average speed of about 11 miles an hour. Above is an anti-trade layer extending from about 6000 ft. to about 15,000 ft. and flowing south-eastwards. The speed of this wind increases with altitude from about 11 miles an hour to 18 miles an hour. Above 18,000 ft. there appears to be a high-level trade wind blowing from the south-east.

Temperature. Temperature is high but relatively constant. The mean monthly temperature for November to April is 79° F. During the trade-wind season the lowest mean monthly temperature occurs in July, when it falls to 77° F. Absolute maximum and minimum for the years 1890–1920 were 93 and 63° F. Daily temperature has an average variation of about 11° F., falling to about 4° below the mean at about 0500 hr., then rising steadily till midday and falling slowly through the afternoon and evening.

Rainfall. Precipitation is heavy, amounting to an average annual fall at Apia of 106·8 in. The average monthly fall in inches is as follows:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
16·8	15·7	13·5	10·2	5·5	5·2	2·6	3·2	5·1	6·1	9·3	13·6

Since the above figures for temperature and rainfall being long-term averages do not give an accurate idea of typical variations in Samoan weather, a graph showing temperature and rainfall over five consecutive years is appended (Fig. 181). The wettest months are those associated with the variable northerly and westerly winds. But

the trade-wind season is also a rainy one; rain falls on an average of at least 11 days in each month at this time.

Data collected at Apia can be regarded as characteristic of anywhere on the north coasts of the islands. Rainfall slowly increases with altitude as the mountains of the interior, acting as a barrier to the wind, cause precipitation. Isohyets (lines of equal rainfall) show a series of concentric loops roughly conforming to the shape of each island; but

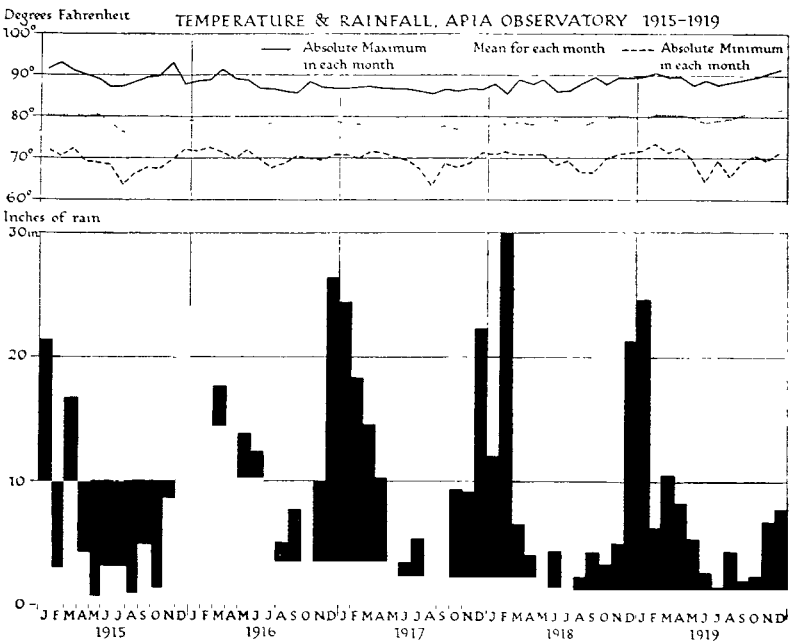


Fig. 181. Temperature and rainfall, Apia observatory, 1915–19

Conditions are similar to this along the whole north coast of Upolu. Based on data from G. Angenheister, *A Summary of Meteorological Observations of the Samoan Observatory* (1890–1920) (Wellington, 1924).

as a general rule the eastern sides of the islands are wetter than the west, as might be expected from the predominance of south-east trade winds. The mean increase in precipitation with altitude amounts roughly to 18% per 300 ft.

A fair approximation for the annual rainfall on the north coasts of Upolu and Savai'i is 118 in., and for the south coasts 157 in. In the highlands of Upolu the maximum annual precipitation is 196 in. and in Savai'i 275 in. Records from the Naval Station at Pango Pango on

the south of Tutuila show an average rainfall of 190 in., some 30 in. more than on the south of Upolu. This apparent discrepancy for a sea-level situation can be explained by the geographical position of the harbour. It is an L-shaped land-locked bay with steep surrounding mountains rising to 2,000 ft. This would naturally give it a rainfall more like that of an inland station at that altitude.

Relative Humidity. The mean annual relative humidity at Apia is 83%, with a very regular diurnal variation of about 14%. The greatest humidity, about 6% above the mean, occurs in the morning, and the lowest, about 8% below the mean, in the afternoon. The high humidity combined with the high temperature tends to make movement through the bush arduous.

Vegetation and Fauna

Except on recent lava flows where the rock has not yet disintegrated the inland soil is a red earth approaching laterite in character. It does not usually overlay the rocks to any great depth, and owing to the steepness of many slopes it is usually dry in spite of the heavy rainfall. Everywhere it is studded with blocks of decomposing basalt. The narrow belt of coral sand round the shore is covered by a rich mould formed from decomposed coral residue and humus.

Thick tropical vegetation covers all the islands except on recent lava flows. The shore is characterized by *Scaevola frutescens* scrub, the almost universal coconut, *Barringtonia asiatica* (a large tree reaching a height of 60 ft. or so), pandanus and many other trees. In certain swampy regions mangroves occur but not very extensively. Inland, even on very steep slopes, except on the more recent lava flows, there is a tall evergreen rain forest. Tree ferns are plentiful in some places (Plate 114). Small patches are cleared in the interior for native cultivation, but even in these clearings large trees are frequently left standing.

There is an extreme paucity of animal life. Animals include the Polynesian rat, and a fruit bat, as well as pigs and a certain number of European cattle which have escaped into the bush.

Only thirty-four species of birds have been observed and most of these inhabit the interior. There are many doves and small parrots. Game birds include the golden plover, wild duck and three species of pigeon. A particularly rare bird, unique to Samoa, is the tooth-billed pigeon (*Didunculus strigirostris*). There are two kinds of snakes,

several lizards and a gecko, all of which are harmless. Fresh-water shrimps inhabit some of the streams and there is a land crab.

Insects are very numerous. A species of mosquito (*Stegomyia pseudoscutellaris*) is a filarial carrier and is responsible for much elephantiasis. There are two kinds of centipede and a scorpion; each has a poisonous sting which is painful but not dangerous. An insect which has caused considerable damage to crops is the rhinoceros beetle, introduced accidentally from Ceylon with rubber plants in 1911.

HISTORY

The Samoa group was sighted by the Dutch navigator, Roggeveen, in the course of his expedition round the world in 1721–2, but he did not land. Some forty years later Bougainville visited Samoa, and, impressed by the number of canoes he saw engaged in fishing or coastwise traffic, named the group the Navigators' islands. La Pérouse landed on the island of Tutuila in 1787 but sailed away after a watering party had been attacked and killed by the local inhabitants. The first British ship to visit Samoa was H.M.S. *Pandora* in 1790. Various other scientific or exploring expeditions touched at the group and whaling ships were frequent visitors. But there was little interest shown in Samoa by European Powers at the time. Colonial expansion in the Pacific was in its infancy and the islands were remote.

There was no settled or stable government. Villages, which were more or less autonomous as far as their own affairs were concerned, bound themselves together into districts for mutual protection under the head of one influential family. Two families, the Tupua and the Malietoa, were predominant, and with the support of various districts fought and intrigued against each other more or less continuously to obtain the ceremonial headship of the group. There was no recognized system of succession, and though both families had intermarried to some extent no stable government had ever materialized.

The history of the islands until their partition and annexation is dominated by the rivalry of these two families on the one hand, and of the three western Powers—Germany, the United States and Great Britain—on the other.

Early Missionary Activity

The first effective European contact with Samoa was when John Williams of the London Missionary Society arrived at the islands in

1830. His arrival coincided with the decisive victory of Malietoa Vainupo over the Tupua family. The London Missionary Society were particularly favoured by the circumstances which had inaugurated a relatively stable government, while the love of ceremony characteristic of the Samoans made them particularly susceptible to the personality of Williams and the Rarotongan and Tahitian missionaries he brought with him. A printing press was set up in 1839, and numerous schools were established, while in 1844 the Malua Institute was founded, and became an important educational centre for the group, and for training Samoan teachers for work in other islands.

In addition to the London Missionary Society there was the Wesleyan mission from Tonga, teachers from which actually began work in the island of Savai'i about 1828 but were initially not very successful; a Roman Catholic mission also started work in 1845.

Early Relations with the Powers

In 1839 the group was visited by the United States Exploring Expedition under the command of Captain Wilkes. In addition to making a thorough survey of the islands and taking particular notice of the harbour of Pango Pango in the island of Tutuila, Wilkes drew up a series of commercial regulations and appointed John C. Williams, the son of the missionary, as acting American vice-consul. This appointment was not confirmed in Washington, but in 1844 the American government appointed a commercial agent, choosing John C. Williams for the post. The first British consul was not appointed till 1847, while the first German consul was appointed in 1861.

The early promise of peace ushered in with the accession of Vainupo, the head of the Malietoa family, in 1828, ended with a dispute over his successor in 1841 which broke out into open war in 1848 and lasted for seven years. Traders in Apia, like the missionaries, carried on as well as possible in the circumstances; some acquired claims to vast tracts of land by selling liquor and more particularly arms and ammunition to both protagonists. In 1855 the Malietoa party overcame the Tupua and a period of comparative peace ensued.

George Pritchard, the first British consul, recommended annexation on economic grounds and also with a view to saving the islanders from their own frequent civil wars and the lawless behaviour of the settlers

in Apia. He was joined in this recommendation by the missionaries who for reasons of their own were particularly apprehensive of French aggression. The Samoan chiefs, whose main contacts with disinterested white men had been with English missionaries, also petitioned for annexation or protection by Great Britain. In the face of these requests the British government held that while they were unwilling to annex the islands they would not be prepared to see any other Power in possession of greater benefits than they held themselves. Till the end of the century they maintained this attitude against the zealous expansionism of the local settlers, and the repeated suggestions from New Zealand, advocating annexation. The other interested Powers, the United States and Germany, took up the same attitude for many years against similar zealous acquisitiveness on the part of their local representatives.

The Growth of Commercial Interests

Regular trade had begun in the islands before 1830, with the visits of whalers for provisions. In later years their calls increased greatly in number and in regularity and provided commercial opportunities for Europeans settled on shore. At the same time, trade in coconut oil developed in Samoa, as in other parts of the Pacific. With these and other minor sources of income a number of traders—some of them members of local missionary families, others representatives of Papeete business houses—maintained themselves at Apia and Pango Pango. The real foundation of the prosperity of later years, however, was laid when the German firm of Johann Cesar Godeffroy und Sohn established an agency at Apia about 1857.

The Godeffroy Company. The Godeffroy company, when it came to Samoa, already possessed considerable experience of Pacific trade; and its local representative, August Unshelm, proved himself a man of enterprise and tact. Under his direction an extensive trade in coconut oil was soon built up there by his firm; and branches were established in Tonga and Fiji. On his death in 1864, he was succeeded by Theodor Weber, who had previously represented the firm in Valparaiso. Weber was a masterful man, perhaps even more energetic than Unshelm, and endowed with considerable tact. Though perhaps none too scrupulous, he certainly gained the respect of all with whom he dealt. Particularly important from the point of view of Samoa were the large tracts of land he acquired on behalf of his firm, and the introduction of indentured labour, to work on the

plantations. The German interests were at first purely commercial. Samoa was the clearing house for the firm's trade from the many stations scattered through the islands in the central Pacific. But the group of large plantations acquired by Weber in Samoa made the German economic interests greater than those of any other Power. It is uncertain when ideas of annexation first occurred to Weber, but he certainly mentioned such a step prior to 1872. German colonial policy, however, did not enter into an active phase till 1885.

The Webb Shipping Line and Meade's Treaty. American commercial interests in the group were not very considerable in comparison with those of Great Britain or Germany. But an attempt to establish a shipping line between New Zealand and San Francisco via Hawaii and Samoa, and the imperialistic attitude of American settlers in Hawaii, brought about a treaty of friendship between the local chiefs of Tutuila and the United States, and a period of American intervention in Samoan affairs.

In 1870, William H. Webb, an American shipowner, wished to establish a steamship line to link up with the recently completed transcontinental railway across the United States. It was felt that mails between New Zealand and London could be accelerated by a fortnight by going across the Pacific, the mainland of the United States and the Atlantic, instead of round the Cape of Good Hope. Webb obtained a subsidy from the New Zealand government and was endeavouring to obtain one from the United States government. He accordingly sent an agent, Captain Wakeman, to survey the harbour of Pango Pango. In 1872, Commander Meade of the U.S.S. *Narragansett* sailed from Hawaii to Samoa and negotiated a treaty with Maunga, a local chieftain on Tutuila. This treaty granted to the United States the exclusive right to establish a naval base and coaling station at Pango Pango. The treaty was never ratified, but it did tend to establish a prior claim to eastern Samoa.

The Growth of Political Interests

In New Zealand the plans for the Webb shipping line emphasized the strategic importance of the Samoan group, and the rapid commercial expansion of the Godeffroy company in the Pacific promoted a desire for annexation. On various occasions between 1870 and 1875 representations were made to London by Mr Julius Vogel, the Prime Minister of New Zealand, to induce the British government to annex

the islands. But at that time Great Britain was still unwilling to embark on further commitments in the Pacific.

Steinberger's Activities. There were thus three parties anxious for the annexation of Samoa by their respective governments, who were reluctant to take any action. Then Colonel Steinberger was sent to Samoa by the President of the United States as a special agent. The circumstances surrounding his appointment of Steinberger were complex. Samoans, possibly tiring of long periods of civil strife, or possibly fearing annexation by Great Britain or Germany, whose subjects had latterly shown themselves more grasping and more successful than Americans, petitioned the United States to annex the group. The traditional isolationist attitude based on the Monroe doctrine, which had prevented the ratification of the Meade treaty, tended to block annexation. On the other hand, naval opinion and that of Webb and his friends was in favour of some form of American control. In the end it was determined to send Steinberger, who was a friend of Webb, as a special agent. He was to pay his own expenses; he was not to commit the government to anything; and he was to report to the President on his return.

On his arrival he gained the confidence of the missionaries and the traders, and also of the Samoans, to whom he was particularly attractive on account of his advice to them not to alienate land. He drew up a nominal constitution which was adopted by the Samoans. It was naturally assumed that Steinberger's visit was a reply to the Samoan request for annexation; on his departure it was fully believed that the United States would annex the group, a belief which Steinberger did nothing to disabuse.

Steinberger evidently expected to return to Samoa, probably as the first American governor. He went to Hamburg where he negotiated with the Godeffroy company an agreement in which he undertook to guarantee land held by them. This is in striking contrast to his advice to the Samoans, and may indeed have been inspired by a desire to overcome the fears of the German company and possible opposition by the German government to the anticipated annexation. But the fact remains that he was to receive a commission of two dollars per ton of copra sold by the government of Samoa to the Godeffroy company.

The United States government was still unwilling to annex Samoa. Steinberger, however, obtained permission to return in 1873 in an American warship, but without any official or diplomatic status. He duly arrived in Samoa bringing with him a present of guns and

ammunition and soon became the power behind a native government, for the form of which he was largely responsible. For two years he was virtually the dictator of the islands, but he soon came into conflict with both English and American traders and with the London Missonary Society. The principal difficulty was over the ownership of land. Finally, in the beginning of 1876 Captain Stevens, commanding H.M.S. *Barracouta*, arrested him on the instructions of both British and American consuls and deported him to Fiji.

National Rivalry. After this incident King Malietoa Laupepa was deposed and a period of unrest followed; this finally broke out in civil war. Meanwhile, there was consular activity on the part of Great Britain, the United States and Germany. Great Britain had annexed Fiji in 1875, and the belief that Steinberger was preparing a filibustering expedition induced local British authorities to investigate the position in Samoa. In 1877 representatives of the Samoan chiefs were dispatched as envoys to Fiji and to the United States to seek protection. The Governor of Fiji replied that Britain was unwilling to establish a protectorate but might be prepared to negotiate with a view to ultimate annexation. The envoy to the United States was more successful. He concluded a treaty in 1878 whereby the use of Pango Pango was given to the United States (a point already covered by the unratified Meade treaty six years before), and the United States promised to act as intermediary between Samoa and any third party. A year later Samoa negotiated similar treaties with Great Britain and with Germany. An arrangement of particular importance which developed out of the visit of the High Commissioner for the Western Pacific, who visited Samoa to negotiate the British treaty, was the establishment of Apia as a municipality, to be a neutral settlement in the event of faction wars in the future, with extra-territorial privileges for whites.

German Intervention in Local Politics

After considerable intrigue by the various Samoan factions and also by the European consuls, it was finally decided in 1881 that Malietoa Laupepa should be king, with Tamasese, a member of the Tupua family, as vice-king. An unsettled peace lasted three years, but in 1883 the German consul, Zembsch, a moderate and peaceful man, was succeeded by Stuebel, probably at the instigation of Weber. About this time German policy developed more definite colonial interests.

The Godeffroy company had gone bankrupt in 1879 and Bismarck had tried unsuccessfully to obtain a subsidy from the Reichstag. The company, now known as the Deutche Handels- und Plantagen-Gesellschaft, had informal official backing, and henceforth the commercial and political aspirations of Germany in the Pacific coincided.

German intervention increased and frequent concessions were obtained from Malietoa Laupepa under the threat of force. A secret request for annexation sent to New Zealand, and refused, was discovered by Stuebel and Weber. In 1885 they persuaded Tamasese to revolt and supplied him with arms and ammunition. They evicted Laupepa from his capital Mulinu'u and later occupied Apia. Protests by America and Great Britain led to a conference in Washington in 1887. In this Great Britain, with other interests of greater moment at stake, supported Germany, but no agreement was reached and the conference adjourned.

Further encroachments by Germany were followed by an abortive attempt to form a Hawaiian-Samoan alliance. Germany then threatened war against Hawaii. American interests in Hawaii were already so great that such a war would have probably involved the United States. They therefore brought pressure on the Hawaiians, who withdrew their proposals. In the beginning of the same year a Bavarian, Captain Brandeis, had come to the islands. In August, when the mail steamer had left for Sydney and the islands were virtually isolated, the Germans declared war on Laupepa, who surrendered to avoid bloodshed and was deported. They then set up a government under Tamasese with Brandeis as his adviser and had virtually complete control of Samoa. Native unrest under the new regime increased, and in 1888 a rebellion broke out, led by Mataafa, a member of the Malietoa family. Two British vessels and one American arrived in the islands and the rebellion progressed with their veiled assistance, while Germany sent a warship to Apia. A combined operation by German marines and Tamasese's forces against Mataafa was unsuccessful and there were further concentrations of German and American ships in Apia harbour. Feeling in both Germany and America was running high. Both countries were talking of war when in March 1889 a violent storm struck Apia harbour. There were seven ships there at the time, three American, three German and one British. The only one not driven ashore was H.M.S. *Calliope*, a new ship with more powerful engines than the others. By dint of good seamanship, she was able to put to sea.

The Berlin Pact and Ultimate Partition

In June a conference of the Powers concerned was held in Berlin and national ardour, no doubt damped to some extent by the disaster in March, was sufficiently restrained for a compromise to be agreed upon. The terms were briefly that Samoa should be declared a neutral territory, Apia was to have a municipal government upon which the three consuls should have a seat, Laupepa was to be restored to the throne, a chief justice was to be appointed by the king of Sweden, and a land commission was to be set up to inquire into land claims, one of the most troublesome of the questions coming before the consuls.

The agreement was cumbersome and unsatisfactory from all points of view. The European residents continued to quarrel among themselves and Mataafa's party were not reconciled to Laupepa.

Mataafa rebelled in 1893, and on being overcome was deported to Jaluit in the Marshall islands. In 1898 Laupepa died, and Mataafa, who had been repatriated shortly before, came forward as a claimant to the throne. The rival candidate Malietoa Tanumafili was chosen, and Mataafa, assisted by the Germans, rebelled.

A commission of representatives of the three interested Powers investigated local conditions and recommended that the only means of providing stable government was to divide the islands. The United States obtained Tutuila, while Upolu and Savai'i were to be divided between Great Britain and Germany. These two Powers came to a separate agreement between themselves, however, in which Great Britain withdrew entirely from Samoa and received compensation in the form of islands in the Solomon group south-east of Bougainville and in the German surrender of rights in Tonga. Germany formally annexed western Samoa in 1899.

Samoan Life in the Late Nineteenth Century

Although any narrative of the history of Samoa at this period is thus, inevitably, taken up largely with the description of international rivalries and civil wars, these comprised but a small part of the activities of ordinary Samoans and of the Europeans settled amongst them. Fighting interrupted cultivation, cut across the work of the missions, and interfered with trade; the prospect of foreign intervention led the foreign residents to hope for the support of their governments in their disputes over land. But these factors never dominated the Samoan scene. The people continued to prepare copra

and to exchange it for cheap prints and hardware at the stores of the traders; attendance at the mission churches and schools did not greatly diminish; and the development of European plantations was pressed on.

What most impressed the visitor to Samoa in the last quarter of the nineteenth century was not the political gossip of Apia and Mulinu'u but the similarity of conditions there to those of other parts of the Pacific. The Samoan village communities, with their schools and unpretentious Protestant chapels, or elaborate Roman Catholic churches, were very similar to those found elsewhere. They seemed more 'civilized' than those of Fiji, less so than those of the Society islands or Hawaii. There also were agricultural, non-European people changing their way of life in response to the challenge of new ideas and new opportunities which European contact had brought them. Apia itself was another Levuka or a lesser Honolulu. It had a street of well-built houses along the shores of the bay; there were substantial warehouses, a shipbuilding yard, a cotton-ginning establishment, hotels and taverns, churches and schools, and the offices of the small local newspapers. European planters, traders from the outer islands, and the natives of the neighbouring villages all frequented the stores of the local merchants. In political matters the bulk of the people, both in Apia and outside it, were concerned with personal security and benefits rather than with the rivalries of the Powers or of the ruling native families.

Thus, when Germany and America assumed responsibility for the administration of western and of eastern Samoa, they found there typical South Sea communities. The problems which confronted them were the ordinary administrative ones which had been faced by the French in the Society islands and the British in Fiji.

Western Samoa under German Control

Dr Solf, the former president of the municipality of Apia, was made Governor of the new German territory. One immediate effect of German annexation was that certain English residents left Apia, fearing discrimination against them. But Solf proved himself a far-sighted, tactful and careful administrator. He visited Fiji to study British methods of colonial administration, and on his return to Apia set up a Governor's Council of six members; two of these were British, which shows that he had no intention of discrimination on national lines. His native policy was enlightened. He appointed

Mataafa as Ali'i Sili, a nominal head of the native government, and set up a hierarchy of native officials, backing them up with the full authority of his administration. In general he made the minimum number of changes necessary, leaving Samoan customs unaltered wherever he could. In particular, the *Ta'imua* and *Faipule*, an upper and a lower house of chiefs formed on a parliamentary model in 1873, were allowed to continue at Mulinu'u as an advisory body to the government, though without pay. In essence, however, the *Faipule* were closely associated with the *Tumua* and *Pule*, the two traditional groups of orator chiefs who represented the autonomous native local communities of Upolu and Savai'i respectively. The rivalries and intrigue inherent in this traditional structure still remained as a serious impediment to the effective working of the German rule. The period of Solf's administration, which lasted till 1910, was one of steady commercial expansion and of greater peace than had occurred in Samoa for many years. But it was marred by two disturbances which had their roots in the old political system and which led the Germans to eliminate this system from their administration.

In 1904 a part-Samoan with the assistance of the *Ta'imua* and *Faipule* tried to form a Samoan Co-operative Trading Society and proposed to levy a tax on all and sundry to finance the scheme. This was forbidden, but was persisted in, to the point of releasing from gaol *Faipule* who had been imprisoned by the government for carrying on with the scheme. After this defiant activity had been suppressed, the *Ta'imua* and *Faipule* were replaced by a council of deputies (*Fono* of *Faipule*) nominated by the Governor. In 1908 an anti-administration movement led by a chief named Lauati attempted to restore the old institution of Samoan kingship, with its associated *Tumua* and *Pule* organization. This was also suppressed but broke out again a year later and Lauati was deported to Jaluit. This movement, known as the *Mau a Pule* ('the Opinion of Savai'i'), may have been in part inspired by discontented white settlers. It had many of the characteristics of the later *Mau* movements which occurred in American Samoa and in Western Samoa under the mandatory government of New Zealand.

In 1914 a New Zealand expeditionary force occupied Samoa without meeting any resistance from the German authorities.

A military government took over the functions of the German administration. The leading German officials were removed for detention elsewhere. German laws and ordinances were confirmed and amended where necessary. This administration continued until the

mandatory government under the League of Nations was set up in 1920.

Eastern Samoa under American Administration

After the tripartite agreement of 1899 an American warship was dispatched to Tutuila to establish a naval base in Pango Pango harbour.

Letters were received from the chiefs of Tutuila and Manu'a acknowledging the 'sovereignty and protection of the United States'. It was not, however, until 1904 that the Tui Manu'a (Lord of Manu'a) formally ceded his territory to the United States. Although the cession was acknowledged by the President of the United States, the islands have never been formally annexed. The President merely authorized the Navy Department to administer the islands. Samoans in fact are not citizens of the United States; they are 'American-protected persons'.

The settlement of traders and commercial exploitation have been severely discouraged and, except for the Naval Station, the islands have not been developed.

The same tendencies which characterized the Samoans in other islands showed themselves in quarrels over the succession in 1909 to the native title of Tui Manu'a. The title was therefore abolished and the naval authorities took firm steps to deal with incipient disorders. After this incident the Samoans remained peaceful until after the war of 1914–18.

The slump in copra prices was conducive to a feeling of discontent in 1919. This took the form of an attack on the Governor who was accused of general maladministration and peculation. The various native chiefs formed a committee which had sufficient authority over the people to bring about a movement comparable to the civil disobedience campaigns which have broken out in India. A commission was appointed to investigate the charges. As a result of the findings of the commission an Auditing Board with native representatives was set up to supervise the finances of the administration. Regulations were enacted to control disloyalty, disorder and the circulation of false statements about official finance. Certain of the more troublesome agitators were deported or imprisoned. The chiefs were satisfied and peaceable conditions followed, punctuated by occasional requests for the release or return of the prisoners. In 1924 the prisoners were released and pardoned.

Discontent, based on a wish for a civilian instead of a naval administration, later broke out again. The leaders of the movement, the *Mau*, expressed their loyalty to the United States but asked for a change of government. In its general character this movement was very similar to the *Mau* of Western Samoa (p. 603). It was no doubt fostered in part by the agitation of some of the few American settlers and part-Samoans. With tact and firmness the movement was suppressed. In 1929 a commission was formed to prepare plans for a more constitutional government for the islands. The draft of these proposals was submitted to Congress but rejected, and eastern Samoa remains under naval administration.

Western Samoa under League of Nations Mandate

The mandate for Western Samoa was conferred on New Zealand in 1920. The New Zealand government was determined to carry out the obligations of the mandate conscientiously, ruling primarily in the interests of the native population. It was therefore probable that a conflict would arise between the administration and the local traders. Many of them were British subjects, they had been well treated by the German authorities, and they looked forward to greater economic opportunities and a larger share of self-government under a New Zealand administration. The local residents had prepared a memorandum setting forth suggestions for the administration of the territory. This was largely contrary to the policy of the New Zealand government and was for the most part ignored. Added to the natural disappointment of the European residents was a period of economic disorganization caused by the deportation of some two hundred German citizens and the seizure of their lands as reparations.

Under the terms of the Treaty of Versailles, ex-enemy estates, including all the land of the former Godeffroy company, were vested in the New Zealand government. This land, known as the Reparations Estates, was administered from New Zealand, and the revenue was devoted to Samoan expenses. The European population continued to criticize the administration for some years. They alleged that there was not enough representation of unofficial opinion; that the number of officials was far too great for the size of the territory and the revenue it could support (an old cry in German times); and that the officials knew little of Samoan conditions and were unwilling to take the advice of the local residents. These complaints were not sur-

prising in view of the strongly contrasted policies of the administration and the residents.

Until about 1926 native opposition was quiescent, but in that year discontent broke out in a *Mau* or 'opinion' movement. In this the Samoans were supported by discontented white residents. From the point of view of the government this action of the residents was improper and relations between them became very strained.

The native discontent was probably inherent in the clash between the traditional Samoan outlook on life and politics, and western ideas. In a sense it was a revolt not so much against the New Zealand government as against the latter's native nominees. The administration, in contrast to the Germans, had attempted to rule through native officials, giving them considerable responsibility. In many cases they were not qualified for this burden, and their prestige was undermined by men of higher rank who had no government appointments, but who by Samoan tradition should have been in positions of authority. The general discontent thus aroused was fostered by the parallel discontent of the European residents and aggravated by particular administrative measures which were opposed to Samoan traditions. Examples were an ordinance providing for banishment from an offender's village and for the removal of his titles; an attempt to abolish on economic grounds the traditional custom of *malanga* (visiting trips round the islands); and the prohibition of distributing fine mats—all matters which vitally affected the Samoan social and political structure.

In its early phase the *Mau* expressed its loyalty to the government and refrained from violence, and there was some hope that the movement might subside. But when O. F. Nelson (a part-Samoan trader of great influence) and two of the European residents were exiled to New Zealand, they continued their campaign of opposition there, receiving considerable local support. The knowledge of this in Samoa undoubtedly fostered the native movement, which took the form of non-cooperation and refusal to pay taxes. A Royal Commission investigated affairs in Western Samoa and reported in favour of the government. It has, however, been criticized for taking too legalistic a view of its terms of reference. In 1929 a procession in Apia organized by the *Mau* to welcome one of the exiled European residents on his return was fired on by the police, and eleven Samoans and one European policeman were killed. Particularly unfortunate from the political point of view was the death of the high chief Tamasese in this affair.

As a result of this clash the *Mau* withdrew from Apia, and early in January 1930 H.M.S. *Dunedin* landed marines who were employed for some six weeks in an attempt to round up the leaders. But these proved very elusive in the wooded interior of the islands. In March the administration arranged a meeting with the leaders of the *Mau* in which these agreed to surrender some twenty of their members required to answer criminal charges, and to disperse to their villages.

From 1930 onwards affairs improved steadily though the *Mau* still remained in existence as an illegal organization. In 1937 following a goodwill visit from New Zealand the ban on the *Mau* was repealed. Nelson was allowed to return from New Zealand. Arrears of native taxes which could not be collected during the earlier period of the *Mau* were written off. The unpopular Samoan Offenders' Ordinance providing for banishment from villages was repealed. Native representation on the Legislative Council was increased to four and Tuimaleali'ifano, the leader of the *Mau*, was appointed to the position of *Fautua* or high advisor to the Administrator. Provision was made for the establishment of a finance committee of one European and three Samoans to act with the Administrator and two officials. The *Fono* of *Faipule* was also given authority to discuss financial affairs.

In the newly elected *Fono* of *Faipule* thirty-three members out of a total of thirty-nine belonged to the *Mau*, and it was estimated that about 80% of the population supported the *Mau*. In 1938 further restrictive legislation was repealed and it was hoped that the unrest was over. But it is significant of the disunity and competing interests in Samoan politics that a small Samoan anti-*Mau* movement had begun at Vaimaangu and Malie, the latter being a principal village of the Malietoa family who had been largely succeeded in positions of authority by the leaders of the *Mau*.

GROWTH AND DISTRIBUTION OF POPULATION

Growth of Native Population

Prior to the regular visit and settlement of Europeans, the population of Samoa was apparently fairly constant. A high birthrate was offset by native diseases and faction wars. Wilkes estimated in 1839 that the population of western Samoa amounted to 46,600 and that of Tutuila and Manu'a to 10,000. As elsewhere in the Pacific the incidence of

European diseases and particularly of the use of firearms in war then led to a steady decline in the population. An estimate of 1881 placed the population of western and eastern Samoa at 28,000 and 17,000 respectively.

By the time of the partition in 1900 this tendency had been overcome and the population of western Samoa had risen to 32,815, according to the first German census. In eastern Samoa, however, the decline had continued; in that year the American naval census showed a return of 5,799 for the population. From then on, except for occasional setbacks caused by epidemics, the figures have risen in both areas. The outbreak of influenza in 1918 reduced the numbers of natives in Western Samoa from 37,113 to 31,422. Since then there has been a steady rise to the present (1940) figures of 57,122 in Western Samoa and of 12,962 in American Samoa. Since 1918 the increase in the population of Western Samoa has thus been 82%; for the corresponding period the increase in American Samoa has been about 61%. But the population reached its lowest level in American Samoa later than in Western Samoa, so that the rate of increase has been greater since 1900 in American Samoa.

A primary cause for the increase in the population is to be found in the extensive medical services in both territories (p. 638), which have in particular tended to lower the infant mortality rate. Vital statistics, often dependent on the returns of native village officials, are not entirely reliable; figures for 1940 show a high birth-rate among the native population of Western Samoa of 40·5 per thousand, compared with a death-rate of only 13 per thousand. In American Samoa similar rates appear to apply.

Density and Distribution of Population

The steadily increasing population will in time lead to serious overcrowding, unless technical advances in agriculture relieve the situation. Out of a total area for Western Samoa of about 1,100 sq. miles, roughly 581,370 acres are held as native land. (In addition, there were 40,000 acres held by Europeans and 10,300 held as Crown Lands.) This gives about 10 acres of native land per head of the population. In American Samoa, although very little land is held by Europeans, only about 4 acres of land are available per head of population.

Upolu, with its convenient harbour at Apia and fertile northern coastline, has always been the most densely populated island. Savai'i,

with large barren or uncultivated areas in the north and west, supported a comparatively small population.

Samoan settlement is almost everywhere littoral, since villages are built near the seashore for convenience in fishing. In Tutuila, indeed, where the interior is most mountainous, nearly all the available places for settlement are round the coast.

There are only two towns in the group, Apia (with a population of about 4,000) and the United States Naval Station at Pango Pango. There are about 230 villages in the group. Of these, 108 are on Upolu, 62 on Savai'i, 57 on Tutuila, and 9 in the Manu'a group. The

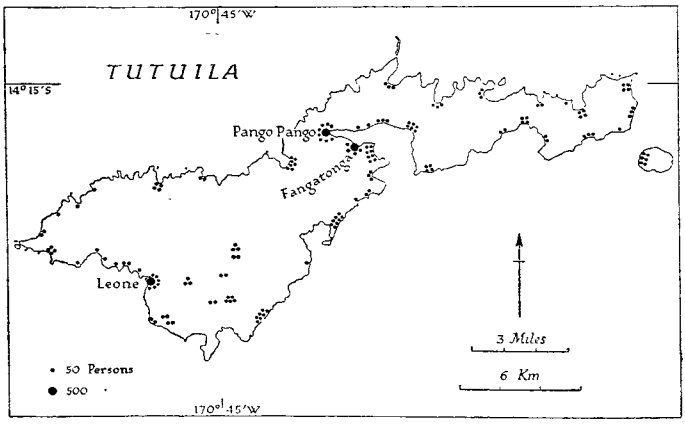


Fig. 182. Distribution of population on Tutuila, 1935

The representation is only approximate to the nearest round figure. Based on J. W. Coulter, *Bernice P. Bishop Museum Bulletin*, no. 170, p. 39 (Honolulu, 1941).

average number of inhabitants in a village is about 200, but the largest have up to 1,000. The distribution of population in Tutuila in 1935 is shown in Fig. 182.

Foreign and Mixed-blood Population

In Western Samoa there were some 400 European settlers in 1940, mostly in or near Apia, and in American Samoa there are United States naval personnel and a few missionaries.

Melanesian labourers were first imported in the 'seventies to work the plantations of the Godeffroy company. A Chinese indentured labour system was continued in the early years of the mandate, but the number of indentured labourers has decreased steadily till there

were in 1939 only 327. In the same year there were 80 Melanesian men and one woman in Western Samoa.

There is a large mixed blood population which may be divided into two classes. The first, who have the legal status of Europeans, are the children of marriages between the early settlers and Samoan women, and their families. These have usually been brought up in the culture of their fathers, and many form an important and influential element in the population. The second class, the offspring of temporary unions of Chinese labourers, Europeans and American sailors with Samoan women, are usually brought up by their mothers and other relatives and are to some extent absorbed into the native community. For census purposes, the latter are listed as natives, and it is impossible to ascertain their total number.

THE SAMOAN PEOPLE

Contacts with European Culture

The Samoans are proud people but friendly. They are proud of their own traditions and customs but friendly to a foreigner with different traditions and customs. They do not expect him to forget his own background and become one of themselves the moment he lands on their own beach, but they appreciate the compliment if he respects their way of life and to some degree adapts his behaviour accordingly. But while the newcomer may be surprised at the letter of some of their customs, in time he will remark a surprising similarity in the spirit of them to that of his own. If a Samoan meets him he will not ask after his health but where he is going. The question is equivalent to our own 'How are you?'—a matter of convention; and it must be noted that they are a conventional people.

For instance, there is a convention that no visit or social occasion is recognized until speeches have been made. This is of particular convenience where houses have no walls and there is complete lack of privacy for those preparing for a guest. The procedure is as follows. The guest may see his host in his house, but will give no sign of having seen him. He enters the house between two of the posts in front and stands still with complete blankness of expression. He must remain like this until a fresh mat is spread for him. Before this is done his host's household may continue their business, ignoring him, but no slight is intended. Presently a member of the household will

spread a mat. This is equivalent to answering the door. The guest will sit down facing his host, but will not speak until the host has made a welcoming speech from the other end of the house. Such behaviour is appropriate to all ceremonial meetings.

The white man, like his goods, is accepted with friendly restraint. He is known as a *palangi*, a term used also as an adjective. He will be given a definite rank by the Samoans, and this will depend not only on that which he appears to hold among his own countrymen but also on his own dignity and behaviour. In American Samoa the general rule is for naval officers to be graded among the Samoan chiefs, while ordinary seamen are placed among the comparatively small proportion of Samoans who bear no title.

Samoan conventions may alter slightly and develop from generation to generation, and they have been made to fit in with the changing conditions introduced by the white man, such as foreign commodities, money and Christianity. But the people are of such a conservative nature that these new elements have never been allowed to sweep the land with the devastating effects to be observed in some other Pacific island communities. Nevertheless, considerable cultural changes have taken place in the last hundred years. The individualism of western civilization is clashing all the time with the traditional communal organization. A money economy is developing, and the views of the younger generation are often at variance with those of their elders. A particularly striking example of this is to be seen in the Fitafita guard in American Samoa, a body of about seventy young men who are enrolled as naval ratings and given the same pay as American sailors. The scale of pay is out of all proportion to the local standard of living. Consequently, while these men are a centre of interest and admiration to the younger generation, they are frequently at loggerheads with their elder relatives over the spending of their money, which according to old Samoan ideas should be available for the use of their kinsfolk.

European goods are coming more and more into prominence. The main foreign commodities that have achieved a place in Samoan life are steel tools, cotton cloth and paraffin lamps. But even so they have hardly yet reached the state of being necessaries of life, and though there would be some hardship to the people if they were suddenly deprived of them, the native culture would still continue. Naturally the urbanized villages near Apia are most affected by the new conditions. Remoter villages, especially those on Savai'i in Western Samoa and in the Manu'a group in American Samoa, still retain much of

their old way of life. In particular, everywhere except perhaps in Apia elements of ceremonial behaviour on formal occasions still survive.

Physical Type

The Samoans, who represent roughly a quarter of the Polynesian race, are perhaps the fairest of all its branches. Their skin colour is a medium yellowish brown, slightly lighter in the women than in the men. Their hair is black or dark brown in colour, though that of



Fig. 183. Head of a Samoan girl

The thick lips, moderately broad nose and wavy hair are characteristic Samoan traits; the epicanthic fold at the corner of the eye is not common. Drawn by Aletta Lewis.

about one-third of the women is bleached with lime to a reddish tinge. It is generally straight or wavy, though stiff frizzly hair does occur occasionally and is probably due to unions with Fijians (Fig. 183).

The people are tall, with average stature in the case of men of 5 ft. $7\frac{1}{2}$ in., and in the case of women of 5 ft. 3 in. Their faces tend to be broad with a high well-filled forehead. The cephalic index ranges from 74 to 87 for men, with an average of 81·3, and from 75 to 86 for women, with an average of 80·8; in other words their heads are broader than those of most Europeans. Eyes are almost

invariably dark brown. The epicanthic (Mongoloid) fold, which gives the characteristic almond shape to the eyes of Chinese and Japanese, is almost unknown. Their noses are straight and of medium breadth. Their lips are thick but not protruding. In general, they may be said to resemble Europeans more closely than does any other branch of Polynesian people.

Language

Their language is a dialect of Polynesian in which the usual Polynesian consonants occur except *h* and *k*. The *h* sound is represented by *s* or *f*. The *k* sound is represented by a glottal closure which causes a 'hardening' of the following vowel. In the written form of the language introduced by the missionaries this is represented by an inverted comma. *L* and *v* represent the interchangeable *l*, *r*, and *v*, *w* sounds. In early transcriptions the *ng* sound, which is present, was represented by *g* which has led to various misleading spellings of place-names. For example, Fagaloa and Pago Pago should be written and spelt Fangaloa and Pango Pango. Recent changes include the occasional introduction of *k* and its substitution for *t*. Thus the word *'umete*, a form of the common Polynesian *kumete*, meaning a bowl, has become *'umeke*.

Culture

Villages (Figs. 188, 197)

The native villages are with few exceptions built along the coast, for the whole complex of Polynesian culture is based on the interplay of gardening and fishing. Before the arrival of Europeans communication between villages was largely by canoe inside the reef.

The villages are large and well organized with canoe houses or boat houses on the beach, numerous scattered dwellings and a church presided over by a native pastor. Inland are taro fields, yam gardens, and coconut and banana plantations.

Houses

The Samoan house is well adapted to the climate. The high thatched roof not only provides protection from rain but is also particularly effective against the heat of the sun, while the absence of walls provides adequate ventilation. The ground plan is roughly oval. The thatch in the better houses is of sugar-cane leaves, in others



Plate 116. Apolima, Western Samoa

Viewed from the western end of Manono. Apolima is the larger island to the right. On the left, with a rock off it, is Nu'ulopa ('Island of Red Berries').



Plate 117. A Samoan fishing fleet

These dugout craft are used mainly for line fishing.



Plate 118. Samoan bonito canoe

The craft has fine lines, with a long gentle sheer at the bow and a deeply crescentic cutwater. A semi-circular socket carved out of the decking at the stern serves as a rest for the fishing rod. The rows of knobs, also carved out of the solid, are purely ornamental.



Plate 119. Samoan round house

Built in traditional style with huge centre post, multiple side posts and domed thatch roof such houses play an important part in ceremonial entertainment.



Plate 120. Kava ceremony

The kava bowl and attendants, whose native ceremonial dress contrasts strongly with the more Europeanized clothing of the onlookers. This particular ceremony was held at Sapapali'i in 1930 in celebration of the local centenary of the London Missionary Society.

pandanus or coconut-palm leaves are used. The roof is raised from the ground by a cluster of tall posts supporting the centre, corresponding to the stick of an umbrella; these support the ridge pole. The roof is also supported at its outer edge by shorter stout poles, usually of breadfruit wood. No interior partitions are built and no outside walls, but round the house just under the thatch are screens resembling venetian blinds which can be lowered either for privacy or protection from the wind. The floor is of coral pebbles loosely placed and covered with a layer of mats. The normal house has a floor raised on stones not more than about 9 in. from the surrounding ground, but the floor in the houses of important people may be raised as much as 6 ft. from the ground. Beds consist of layers of mats and bark cloth, though to-day European sheets and mosquito nets are often used. All mats, furniture and utensils not in use are stored in the rafters under the roof. Food is suspended by a rope from a convenient beam for protection from rats.

Cooking is done in a small outhouse, a separate building made on the same principle as the dwelling, but more roughly. The old method of cooking was to use an oven consisting of a large pit lined with hot stones, but European oil stoves are now a feature of many cooking houses.

To meet the demands for a larger building in which to entertain guests, to hold ceremonial meetings or to drink kava, special houses are built. They are sometimes merely an enlarged form of dwelling house, but the difficulty experienced by people at the two ends in hearing each other limited the length of such structures. The tendency therefore has been to keep the middle section under the ridge pole short and to expand the sides, thus making a round house. Round houses are the finest architectural achievement of the Samoans and are built by members of a carpenter's guild. While the frame for the rounded ends of a normal house can easily be made by splitting and bending timber, the heavier and larger curved framework of a round house is carved from the solid in short lengths of timber joined by a stepped scarf joint which is subsequently lashed (Plate 119).

Diet

The principal animal foods are pork and poultry. Pigs are killed only on ceremonial occasions, and even then fowls are often used as substitutes. Fish of many kinds, from small reef types to shark and bonito, are an important food item. They are usually cooked, but the flesh of bonito is often eaten raw.

Vegetable foods form the larger part of the normal Samoan diet. The staple is taro, a root crop found in most parts of Polynesia, and its leaves are the only form of green vegetable in regular use. Yams and sweet potatoes are also commonly eaten, and the coconut is very important, its meat being an ingredient of almost all made-up dishes. Breadfruit, banana and papaya are also eaten, though the last is not highly regarded. Nowadays European tinned salmon and meat, known under the generic name of *pisupo*, are very popular; the native name may perhaps have been given because the first European food known to the Samoans was pea soup. For drink, apart from fresh water, the 'milk' of the green coconut is used and kava (p. 617) is also largely drunk.

Chieftainship and Political Organization

Samoa differs from most large Polynesian communities in its system of chieftainship. No established rule by a single dynasty ever seems to have developed, and the almost feudal organization characteristic of Hawaii did not emerge.

The basis of the organization is an intricate system of graded chiefly titles, essentially of two kinds: *ali'i* and *tulafale*. It is difficult to translate these terms neatly, but the former may be called titular chiefs, and the latter orator chiefs. (They are commonly referred to as 'chiefs' and 'talking chiefs' respectively.) A chief of either type may be of high rank or low rank, and for practical purposes there are many orator chiefs who are of higher rank than many titular chiefs. But a titular chief of whatever rank is always entitled to certain courtesies of address and behaviour, while an orator chief does not receive these; he, on the other hand, has certain privileges—the right to address meetings, to preside over the distribution of food, and to receive presents from titular chiefs on formal occasions. On many ceremonial occasions a high titular chief is the presiding dignitary, a high orator chief his spokesman and executive official; they are the dual elements necessary to the conduct of affairs. All title-holders, both titular chiefs and orator chiefs, are referred to by the generic term *matai*. Since most of the title-holders are heads of households, the term is also used to cover these men, and also men whose titles are of so low rank that few people know to which category they belong. But the essential significance of being a *matai* is that one holds a title which allows one to sit in the local council (*fono*). In the Samoan system a person receives consideration not as an individual but in virtue of the title which he holds and the privileges which attach to it.

Succession to a title is elective within a family, and while heredity is a contributory qualification general ability, popularity and the capacity to make a good speech are the principal considerations borne in mind when a title has to be filled.

Under such a system no feudal government based on the conception of a purely hereditary aristocracy has arisen. Each village was formerly and is still to some extent ruled by a council (*fono*) of title-holders, including both titular chiefs and orator chiefs. Groups of villages in turn formed larger units, each with its own *fono*. In ancient times there were in all fourteen major divisions. The title to a seat on a particular village *fono* might also carry with it the right to a seat on a sub-district or district *fono*. But since each village was autonomous in its own affairs there was no complete administrative control over the whole group, which represented at best a very loose confederation which might conceivably band together for common defence against an invader from Tonga or Fiji. Precedence in the *fono* and the right to speak depended not so much on the ability of a particular chief as on the traditional importance of the title he held. But in practice four titles, those of Tuiaana, Tuiatua, Ngatoaitele and Tamasoali'i, came to be regarded as of greater ceremonial importance than any others. At one period, owing to wide kinship ramifications, all these four titles became invested in one person, known as the Tafa'ifa, the paramount head of Samoa. While of great ceremonial prestige, this title gave little if any real political power, though Europeans in later times complicated the situation by attempting to recognize its holder as a king. In practice the struggle for this ceremonial headship tended to be fought out by intrigue and war between two predominant families, the Tupua and the Malietoa, each with its major seat on the north coast of Upolu. And owing to the important executive role played by orator chiefs in the Samoan polity, the rivalry assumed also the form of a contest between the two major groups of these chiefs, known as the *Tumua* and the *Pule*. In essence the former represented the two districts of Aana and Atua in Upolu, while the latter represented Savai'i, in alliance with the district of Tuamasanga in Upolu. The island of Tutuila tended to follow the district of Atua, in which lived its overlord, and the little islands of Apolima and Manono (Plate 116), whose chiefs had a voice in the disposal of the Malietoa title, tended to support that faction. Only the distant Manu'a islands, with their high chief, the Tui Manu'a, stood independent of the rival groups, and had an exclusive political organization of their own.

In modern conditions the system of chiefly titles has retained its functions on ceremonial occasions, but has lost much of its former political importance, even though in a modified form it is utilized by the administration in both Western Samoa and American Samoa. The highest titles, those of overlordship, have been shorn of much of their power, and for practical purposes their holders have influence over a much more limited area. In American Samoa, for instance, the authorities for a time insisted that the title of Tui Manu'a should be kept in abeyance, and even when they allowed it to be revived in 1930, the powers attaching to it were rigidly curtailed. Here, where the administration registers titles officially and adjudicates in cases of disputed succession, the tendency has been to limit the number of title-holders, so that it has been estimated that for the territory as a whole only about 18% of male Samoans over 16 years of age are *matai*. In Western Samoa, on the other hand, where the appointment to titles has been left entirely to the Samoans themselves, the tendency has been to enlarge the number of title-holders by reviving ancient titles and splitting existing ones among several incumbents, thus spreading the privileges more widely and decreasing the power of individuals. Here in 1926 there were nearly 3,000 *matai*, representing over 30% of male Samoans over 16 years of age. In both territories the powers and privileges of *matai* have lessened in ordinary affairs, owing to growing economic individualism; to the spread of education and ideas of equality before the law; to the use of common means of transport such as buses which throw both sexes and all ranks together; and to the increasing entry of women into local administration and even, as in the women's *Mau* in Western Samoa, into politics.

Family Organization and Property Holding

Kinship ties are very important in Samoan social and economic life. All who are related by birth or adoption are recognized as belonging to one kinship group, a kind of extended family, and membership is counted through both the male and female lines. The tendency is for descendants in the male line to manage and inherit the family property (including in former times the family gods), but for immediate female descendants and their children to have claims and privileges. Particular weight is given to the female line because of the supposed power of a woman to lay a curse on her brother and her brother's children.

Land was held formerly by the whole family group and ad-

ministered or distributed by the *matai*, the head of the family. But in practice the occupier of a plot of land might be considered to be the owner. The tendency everywhere to-day is for land to be more and more recognized as the property of the occupier. This notion is furthered in Western Samoa by the government practice of leasing for a nominal rent five-acre plots to Samoans on marriage. When the first plot has been fully cultivated they have a right to acquire a second five-acre plot. Native land holding may therefore be said to be of two forms: the nominal title to the land of a family, known as the *pule*, and vested in a *matai*; and the individual ownership of small holdings.

In former times any member of a family could take the food or ordinary personal property of any other for his own use. This form of modified communism combined with the natural abundance of the necessaries of life discouraged initiative in the acquisition of wealth. This is to some extent altered to-day by a convention which has grown up that European goods acquired from traders shall be regarded as the personal property of the owner.

Religion

For over one hundred years missionaries have worked in the Samoan islands. All the people are nominally Christian, though numerous survivals of Polynesian beliefs remain, especially the concepts of ghosts (*atua*), and of their power to cause harm to human beings. Formerly Tangaloa (commonly known elsewhere in Polynesia also, as Tangaroa) was worshipped as a creator god, and a deity called Pili, incarnate in a lizard, took second place.

To-day every village has its native pastor. Three-fifths of the people are adherents of the London Missionary Society; a large number of the remainder are Methodists. Roman Catholics, Seventh Day Adventists and Mormons have also established missions.

Christianity has modified certain aspects of Samoan life fundamentally. Every village has its church, where the people go on Sundays, sing hymns in their own tongue and with their own spirit, and indulge the pastor's native love of oratory during the sermon. They subscribe money, hard-earned by copra cutting, to the missionary societies or for the building of bigger and grander churches than those of their neighbours. These activities are combined with Bible interpretation of a literal kind. What has happened is that Christianity has substituted Christian theology for the Samoan gods without modifying very much the native attitude towards the supernatural.

Ceremonial Life

Elaborate rules of precedence accompany meetings of *fono* (councils). The drinking of kava ceremonially and feasts in which food is ceremonially divided and distributed with strict attention to rank are features of all important functions. *Malanga*, journeys on which visits are made primarily to exchange fine mats (which have almost taken on the characteristics of a ceremonial currency), are also accompanied by much ceremonial behaviour. Since ceremony still plays such an important part in Samoan life, some of its basic aspects must be understood by every visitor to the islands.

The Taupo

Formerly every village had its *Taupo*, a virgin of rank who was the focus of most ceremonial behaviour. To-day the institution survives only in the most conservative regions such as Manu'a and in the villages of particularly important chiefs such as Malietoa. But many of the ceremonies connected with the role of the *Taupo* still survive. She was frequently the daughter of the chief and her functions were first and foremost those of a village hostess. She and the young girls of the village prepared kava and distributed it. She danced before visitors, and on her behalf gifts of fine mats were made to visitors. Similarly when her village went on *malanga*, i.e. visited a neighbouring village, fine mats were presented nominally to her. The economic balance in the distribution of fine mats was maintained by these visits between villages. She was also in a sense a political pawn. On her marriage to a neighbouring chief, a further distribution of mats took place. Alliances between villages, whether for war or other purposes, were cemented by such marriages and fine mats were also thus kept in circulation. A chief would marry several *Taupo* in the course of his lifetime, and they would after a time return to their own villages and probably marry again. Chiefs of villages, having paid out large quantities of mats with their *Taupo*, would recoup themselves by arranging marriages with *Taupo* of other villages.

The Malanga

A *malanga* was formerly a ceremonial visit to another village which was by custom bound to provide entertainment and give kava, food and mats to the visitors. To-day the term *malanga* is used generally by Europeans to imply a visit or tour of the islands. Samoans in accordance with their traditions of hospitality will provide elaborate

entertainment for visitors. The actual details of the ceremonial varies from visit to visit, but all contain four basic elements, a speech by an orator chief (*tulafale*) of the entertaining village and an appropriate reply by a *tulafale* in the visiting party; a gift of food; a kava ceremony; and a feast. Before embarking on a *malanga* a *tulafale* should be taken, for he alone will have sufficient knowledge of traditional ceremony to be able to make the appropriate responses and know the correct deportment at any particular juncture.

After the welcoming speech, with its due reference to the ranks and titles of the visitors, and the appropriate reply, a formal presentation of food to the guests takes place, usually in front of the guest house. If the visit is informal, the gift may consist only of a coconut.

The 'Ava (kava) Ceremony (Fig. 184, Plate 120)

The next phase is the kava ceremony, the pattern of which is essentially the same at all formal occasions. Of all her functions that of making kava is probably the one which the *Taupo* practises most often. Kava is almost the only alternative to coconut milk or water as a thirst quencher, and its consumption has been made one of the basic features of the ceremonial life. The drink is made from the root of the *'ava* (*Piper methysticum*) plant. In olden times this root was chewed by the *Taupo*, who then spat it into a wooden bowl, poured water over it and left it to ferment through the action of her saliva. In those days one essential qualification for the position of *Taupo* was a good set of teeth. Nowadays the root is ground between two stones and the drink is unfermented. But when drunk to excess it is said to have a curious effect on the legs, as if one were mildly intoxicated.

At a *malanga* the orator chief presents a kava root to his hosts. They in turn give him several roots which he divides, setting a certain amount aside to be used in the immediate ceremony and the rest for further kava making during the stay of the party. The *Taupo* seats herself on a mat with a large round wooden bowl supported on many legs in front of her. On her left sits an orator chief, on her right a young man, with another behind her just outside the house. Water is poured over her hands to cleanse them. Ground kava root is put in the bowl and water poured over it. The *Taupo* stirs the mixture with a handful of shredded fibre from the inner bark of the hibiscus, using ritual motions, and gathering up the grounds of kava. Three times she throws the pad of fibre over her shoulder to the attendant outside the house, who shakes it out and returns it. Then all the members of the

company clap their hands in slow regular beat, to indicate that the kava is ready to be served.

The young man rises from beside the *Taupo* and holds over the bowl a cup made from a polished half-coconut shell. The *Taupo* holds the saturated hibiscus fibre over the cup to fill it. The orator chief proclaims the name and titles of the most important person present, who claps his hands. The young man bears the cup to him and presents it with a deep bow. After delivering the cup he steps back two paces and stands at attention waiting to receive the cup back. In this



Fig. 184. Taupo preparing kava

Seated cross-legged on a mat of plaited coconut leaf, and with a garland of flowers round her neck, she is preparing the infusion of kava in the traditional wooden bowl. Drawn by Aletta Lewis.

the practice is different from that in Tonga, where the cup may be spun along the floor. A titular chief should take the cup from the server by hooking his forefinger over the rim; an orator chief takes it in his open palm. If he is sitting next to a titular chief he holds out his hand on the far side. If he is sitting between two titular chiefs he takes the cup in both hands. On receiving the kava cup a small libation should be poured on the floor. For this purpose it may be necessary to lift up the corner of the mat one is sitting on.

It is not considered a breach of etiquette to refuse kava, or having taken a cup to gargle the contents and spit them out behind one.

Before drinking it is customary to mutter the salutation *manuia*. A small sediment is often found in the bottom of the cup. The residue containing this should be tossed out behind one. Anyone wanting a long drink, and seeing his cup only half full before drinking may send it back to be filled up.

The Feast. In the feast which follows the kava ceremony the guests remain seated in the same ceremonial order. Food is placed on the floor and a portion is distributed to each person. This will include taro, a breadfruit, perhaps some pork, fish or fowl (legs are considered a greater delicacy than the breast or wing) and *palu sami*. The last is a paste made of pounded coconut meat with salt water added

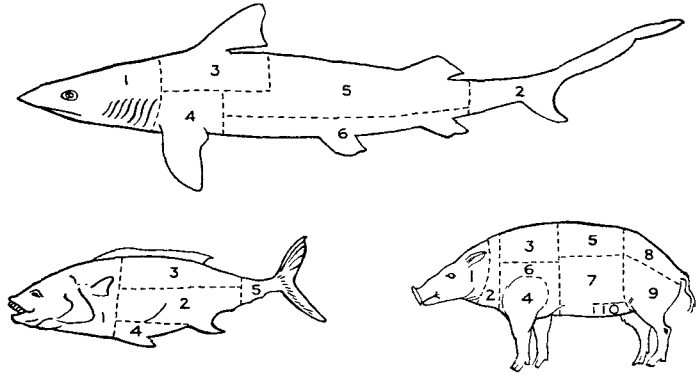


Fig. 185. Method of dividing up flesh food on ceremonial occasions

Each cut (shown by number and dotted lines) goes to a person or group of definite status. Thus a high chief receives no. 2 of shark, no. 1 of bonito, no. 5 of pig; an orator chief, no. 3 of shark, no. 2 of bonito, nos. 2 or 4 of pig; a *Taupo*, no. 1 of shark, no. 10 of pig. Based on Te Rangi Hiroa (P. H. Buck), *Bernice P. Bishop Museum Bulletin*, no. 75, pp. 121, 124, 125 (Honolulu, 1930).

to give it a sharp taste. Normally one uses the hands in eating, but *palu sami* should be scooped up with the midrib of a palm leaf provided for the purpose. Green coconuts are provided as a beverage. At the end of a meal bowls of water and towels are brought round for washing the hands.

An important feature of a feast may be the division of the flesh food. Sometimes pig and large fish are cut up into small pieces, but on other occasions they are divided ceremonially and appropriate portions given to different people according to their rank and status. Fig. 185 shows the appropriate portions into which shark, pig and bonito are cut. Since a well-cooked pig is very difficult to divide, it

has become the practice to undercook the pig, or possibly even only just warm it. This does not matter, for from the Samoan point of view the essential feature of the distribution is not to provide well-cooked meat but to pay proper respect to everybody present by giving him his appropriate portion. A recipient is not expected to eat all his share. In fact it would be far too big. After being toyed with, portions are passed back to a junior relative or attendant to be taken home and re-cooked for the next meal.

Dancing

After a ceremonial feast, or on less formal occasions too, it frequently happens that a dance (*sivasiva*) is held. This is the one public

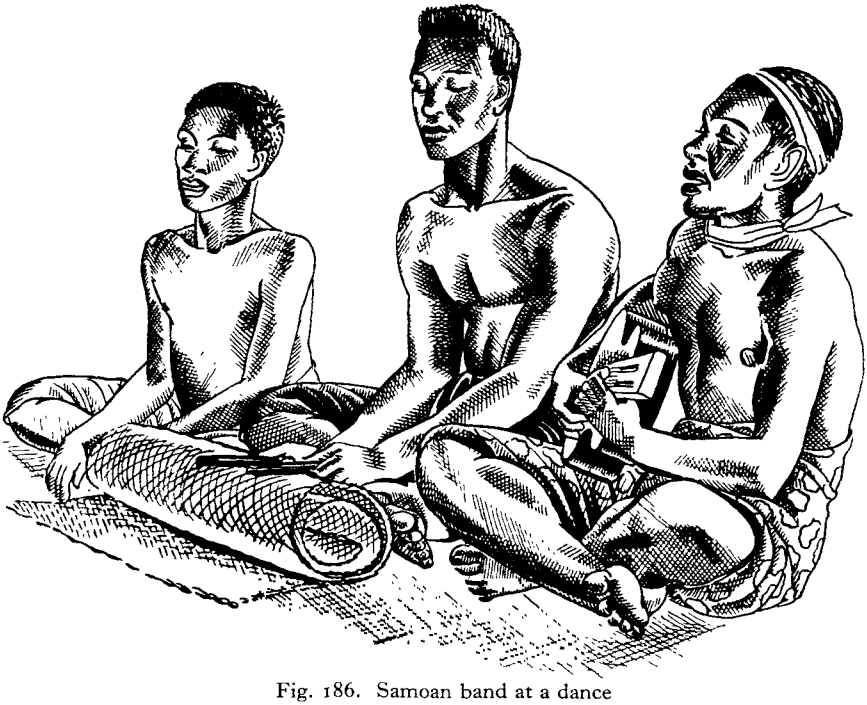


Fig. 186. Samoan band at a dance

The man in the centre provides the basic rhythm by tapping on the rolled-up mat, while the player on the right outlines the melody. The illustration gives a good representation of Samoan physical types. Drawn by Aletta Lewis.

occasion when the house is given up to youth. The older married men and women, even the chiefs, move to the back and take no active part, and the young people take possession.



Fig. 187. Samoan dance at night

The two men act as foils to the girl in the centre by introducing eccentric features into their dancing. Drawn by Aletta Lewis.

A visiting *Taupo* takes the central seat and plays the central role. She will be seated in front of the group of young visitors and lead the ritual applause which follows each number. All unite to supply the orchestra by singing and clapping. In addition there are drums of bamboo and rolled-up mats (Fig. 186) and most villages can produce a steel guitar or a ukulele.

The arms play the principal role in the dance, the body and legs secondary roles, the feet commonly supplying a syncopated rhythm as they are turned in and out. Some dances are executed in a cross-legged, sitting position from the beginning to end. But usually the dancers are on their feet, with the body bent at knees and groin. All kinds of movements, capers and postures lend variety (Fig. 187).

Technology

The technical processes of house construction have been described already (p. 610). Since so many of the people are engaged in a peasant economy a brief account of the technology of agriculture, fishing and craft-work is necessary.

Agriculture

Behind the Samoan villages, often some way inland, are small gardens and plantations, but nowhere is agriculture extensive. Enough is grown to satisfy personal requirements, to provide a small surplus for entertainment, and for church purposes, but no more. Under government instruction fifty coconut palms should be planted per head per year. This rule was introduced in the early days of the German administration but in practice the yield of copra has not been very great. Samoans will usually collect only enough copra to sell to the trader to meet their cash needs (Fig. 188).

The principal root crops under native agriculture are the usual Polynesian trio of taro, yams and sweet potatoes. Two forms of taro cultivation are in use, dry taro in the bush and wet taro in the low-lying swamps round about the villages. In wet taro cultivation an interesting practice of covering the growing plants with coconut fronds and other vegetable matter is common. The purpose of this mulch is to prevent excessive evaporation and also to keep down weeds. In addition to coconuts, which are planted with government encouragement, the paper mulberry, banana and breadfruit are cultivated. The inner bark of the paper mulberry is used for making bark-cloth, while the breadfruit tree provides shade for the villages as well as fruit.

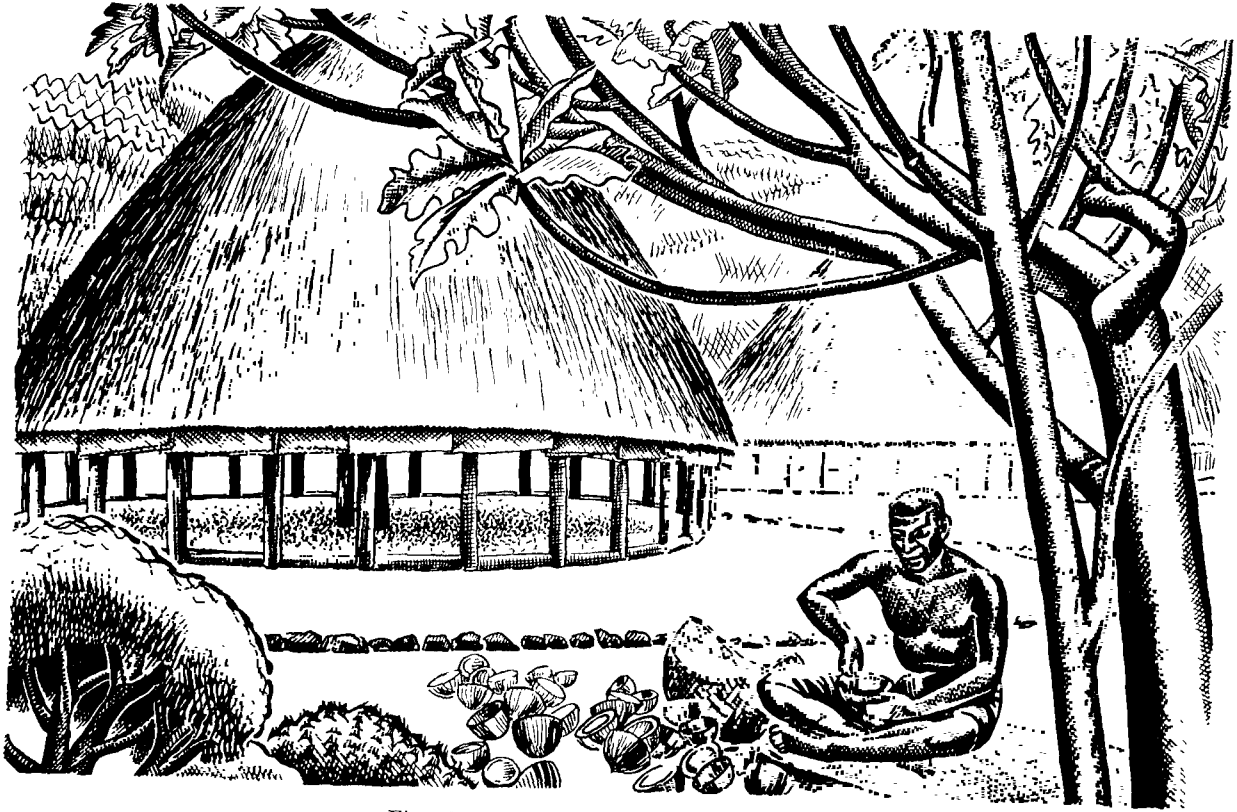


Fig. 188. A Samoan villager preparing copra

The flesh scooped out of the coconut shells is put into the basket, to be later dried in the sun or in a kiln. Drawn by Aletta Lewis.

Hunting

There is very little hunting in Samoa. A few wild pigs are trapped, the mechanism being a noose operated by a bent stick. Birds, which include parrakeets, rails, terns, doves and pigeons, are caught in snares by children and sometimes kept as pets, though the rails may be shot for sport with bows and arrows. Formerly pigeons were netted or trapped from a hide, the sport being one to which high chiefs were much addicted. Rats were trapped by a noose inside a bamboo tube, which was placed in recognized rat runs or tracks. This was a variant of the typical Polynesian rat trap.

Fishing

Fishing plays a very important part in the life of most Samoans. The main source of fish is the area between the shore and the edge of the reef, and these waters are fished daily. Many methods are employed. People grope about catching fish with their hands; artificial piles of rock and coral are made to attract fish into their crevices, where they are caught either by hand or in baskets; fish spears, traps and weirs are also used. A method employed to catch small octopus is to poke with a stick in cavities in the rock where they are likely to hide. Irritated by the stick they come out and are seized and bitten between the eyes. They are generally too small to be dangerous and women frequently catch them.

Larger octopus are caught with the aid of a lure. This is made from a conical piece of basalt to which are attached two pieces of a cowrie shell (*Cypraea tigris*) and a stick of coconut wood. The lure is trolled from a canoe in likely places in the lagoon. An octopus on seeing the lure will lazily stretch out a tentacle to seize it. When the fisherman notices this he draws the lure up. The octopus fearing the loss of the bait suddenly pounces on it with all its tentacles as it is being drawn out of the water. This is the moment for the fisherman to seize the octopus and kill it. A large octopus should not be lured to the surface in shallow water since it can be very dangerous there. By keeping two or more tentacles on the bottom it can pull a canoe under.

Fish caught outside the reef from canoes include sharks and bonito. Bonito are caught on an unbaited bone and turtle-shell spinner trolled from a canoe with a large fishing rod stepped in the stern. Shark are caught from canoes or more often *fautasi* (native long-boats) in a stout noose and stabbed with knives. The process is exciting and frequently dangerous. A rattle of half-coconut shells threaded on

a stick is used to attract the fish. A noose is held open behind the bait alongside the canoe. After the shark has passed his head through the noose to reach the bait it is drawn tight and held until the fish is killed. The noose, formerly made of coconut fibre braid and seized to make it stiff, has now been replaced by stout European rope with an eye-splice at the end. Manilla hemp or other soft ropes cannot be used because they are not rigid enough to keep the noose stiff and open in the water.

Canoes

In former times large double canoes somewhat similar to those of Tonga and Fiji, with a deckhouse amidships and a single large lateen sail, were in vogue. Various sizes of single outrigger canoe, either dug-out or plank-built and equipped with sail and balancing platform, were used for fishing. Two very interesting types of long-boat, the *tuamalua* and the *fautasi*, came into use in the middle of the last century but the former have disappeared completely to-day. They were built up of small planks or slabs fitted together and sewn with coconut fibre. Owing to the government veto on deep-sea voyages and the use of schooners and launches with kerosine engines, there is no further use for most of the larger native-built vessels. The smaller sizes of native canoes are still in use for fishing (Fig. 189, Plate 117).

The ordinary one-man dug-out canoe known as *paopao* is about 17 ft. long, without decking or thwarts, and with an outrigger float on the port side attached by stanchions to two outrigger booms, which stretch across the hull. The beam is about 14 in., the bow, like those of other Samoan canoes, is of clipper form with an angular forefoot. The stern is rounded and slopes to a point. These craft are only paddled. A larger version of this type is the *soatau*, which is only distinguished from the smaller canoe by its greater length, the presence of four outrigger booms and the occasional use of a sail of European manufacture.

Small plank-built canoes are used for bonito fishing (Plate 118). Broadly speaking they have the same general form as the *paopao*, but they have probably the most graceful lines of all Polynesian canoes. They are decked fore and aft, with a step near the stern to carry the bonito rod. The planks are of irregular shape but are finished most carefully. Each plank is hewn from a solid piece of timber with flanges on the inner side. The flanges of adjacent planks butt up against each other and are lashed with coconut fibre sinnet, which

does not appear on the outside of the hull. A piece of bark-cloth coated with gum is placed between the flanges for caulking.

Craftwork

Fine mats are still plaited of pandanus leaf or hibiscus fibre; bark-cloth is still beaten from the inner bark of the breadfruit tree, and kava bowls and other domestic utensils are still carved. Bark-cloth (known as *siapo* in Samoa in contrast to the more usual Polynesian word *tapa*) is made from the inner bark of the paper mulberry. This is soaked in water for a time and hammered out on a log. In quality it is rough and does not compare favourably with that from Fiji or the much finer cloth formerly made in Tahiti or Hawaii. It is ornamented by being placed over carved wooden blocks and rubbed with red earth. Thus the relief pattern of the blocks is imparted in red to the cloth. It may also be painted with crude freehand designs of a geometrical character. Occasionally in former times it was 'varnished' with breadfruit gum to make it waterproof.

(For bibliographical note see Chapter XIV.)

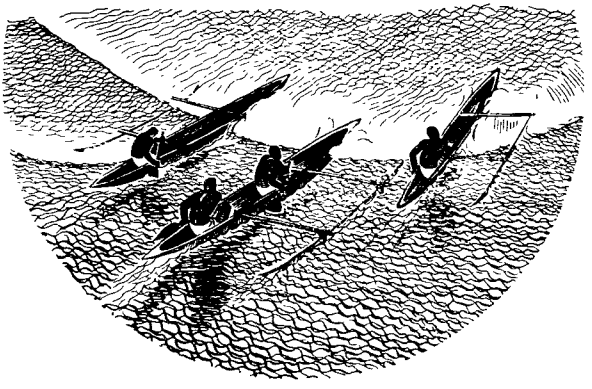


Fig. 189. Canoes going out over the reef

This illustrates in stylized form the forcing of light outrigger canoes through the surf. Drawn by Aletta Lewis.

Chapter XIV

THE SAMOA GROUP (*cont.*)

Administration: Social Services: Economics: Communications and Ports: Savai'i: Upolu: Tutuila: Manu'a Group: Rose Atoll: Bibliographical Note

ADMINISTRATION

Western Samoa is governed by New Zealand under mandate from the League of Nations, and American Samoa by the Navy Department in Washington. Trade and commercial exploitation in both territories play a subsidiary part. In American Samoa the primary purpose of the occupation has been to provide a fueling station for the United States Navy, but native well-being is, after naval requirements, the most important factor governing the form of the administration. In Western Samoa the terms of the mandate specifically require the islands to be governed in the interests of the native population. Past history and the general nature of Samoan customs and outlook have combined to make the problems of administration difficult. In both parts of Samoa native maladjustment has led to the formation of *Mau* or 'opinion' movements, which have at times found outlet in civil disobedience. In general, however, bloodshed has been avoided, and to-day conditions are quiet and the people reasonably contented in both regions. The administrative problem has been greater in Western Samoa owing to the presence of a considerable number of white settlers and traders. Many are the descendants of the protagonists from the troublous times towards the end of the nineteenth century when international rivalry led to a partition of Samoa between the United States and Germany. The Administrator of Western Samoa has, therefore, had before him the dual problem of satisfying the trading requirements and aspirations of the white settlers and at the same time developing the institutions of the native population, often in the face of strong conservatism on the part of the natives themselves.

Administration in Western Samoa

The mandatory Power took over and developed the well-established German governmental hierarchy in 1920. At the head of the government is the Administrator, appointed by and answerable to the New

Zealand Minister of Island Territories. He is assisted by various executive departments, the most important of which are native affairs, education, justice and health.

Laws for the territory are passed either by the New Zealand government or by a Legislative Council which at present consists of the Administrator, six nominated official members, two nominated unofficial European members, and four native members elected by a native council of representatives, the *Fono* of *Faipule*. There are also two honorary advisers on native affairs, the *Fautua*. The *Fono* of *Faipule* is a representative body of thirty-nine deputies elected or nominated according to native custom by the various districts.

The present districts which elect *Faipule* are primarily based on ancient political divisions. The major administrative divisions are fewer in number, and some of them have been re-named and re-grouped at various times. The districts and sub-districts marked on official maps are as follows:

Districts and Sub-districts of Western Samoa

Islands	Districts	Sub-districts	Remarks
Upolu	Aana	Aiga-i-le-tai	Including islands of Manono and Apolima
		Aana (North)	
		Saleaula	With Lefanga; Falelatai and Samatau later added
	Tuamasanga	Apia municipal district	Approximately the same as the old municipal area
		Tuamasanga North	Feleata
		Tuamasanga South	
		Tuamasanga East	Vaimaunga
		Tuamasanga West	Sanganga and Leauva'a
	Atua	Itu Anoama'a	
		Falealili	
		Va'a-o-Fonoti	
		Lepa-ma-Lotofanga	Separated later
		Aleipata	
Savai'i	Vaisingano		
	Ngangaifomaunga		
	Nganga'emaunga	Saleaula and Lealatele	
	Fa'asaleleanga		
	Palauli East		Divided by Satupaitea
	Palauli West		
	Falealupo		
	Satupaitea	Salenga	Ancillary to Satupaitea on earlier maps
		Alataua	

Based on: *Lands and Survey Department Maps*, 1921–2, 1933; F. M. Keesing, *Modern Samoa*, pp. 49–51 (London, 1934).

In addition to the Legislative Council, the *Fautua* and the *Fono* of *Faipule*, there are native officials appointed by various departments.

In 1937 the total number of all native employees of the government amounted to about 430 persons, of whom about 180 were district and village officials.

The Department of Native Affairs consists of a Secretary at Mulinu'u, a Resident Commissioner in Savai'i, and numerous native officials. The key personnel are the *pulenu'u*, the village managers. The functions of a *pulenu'u* include jurisdiction over petty offences, the collection of statistics, enforcement of government orders and the general interpretation of regulations. Among other duties he has to supervise a weekly search for rhinoceros beetle (which damages plantations), see that the villages are kept clean, and keep records of births, marriages and deaths. He is elected according to local custom and is usually one of the *matai* (heads of families) in the village. *Pulenu'u* preside over meetings of elders in the villages and attend meetings of delegates from other villages which are in turn presided over by a *Faipule*, the district representative. The *pulenu'u* is thus the essential link between the village and the government.

Administration in American Samoa

Eastern Samoa has been directly under the control of the United States navy since 1900. The Commander of the Naval Station in Pango Pango bay is the ex-officio Governor of the territory. The health officer and customs officer are naval officers, but the Secretary for Native Affairs is a civilian appointed by the Secretary for the Navy in Washington.

The territory is divided into three districts—eastern Tutuila, western Tutuila, and Manu'a, each with a Samoan district governor. Further subdivisions into counties are made on the basis of land ruled by some seventeen chiefs. Succession to these appointments was formerly loose and indeterminate, but the American authorities have made succession hereditary and dealt with disputed claims in the High Court of Justice (p. 631). The position of the *pulenu'u* or village manager is virtually the same as in Western Samoa. Local legislation is undertaken by village councils under the guidance of the *pulenu'u*. There is no legislative body on which the natives are represented, as in Western Samoa. But an opportunity for the expression of native opinion is afforded by a *Fono Tele*, a 'great council' which meets annually. This consists of all district governors, judges, county chiefs and selected *matai* and is presided over by the Governor. Three weeks' notice is given of these meetings. The various officials and

representatives then have an opportunity of holding preliminary meetings and discussing agenda.

In practice the *Fono Tele* has tended to become a ceremonial affair, the primary purpose of which is to render honour to Samoan dignitaries. Only important persons speak and few decisions are taken.

Interim advisory machinery for maintaining contact with the Samoan people is provided by several boards and committees, some of which meet regularly and others of which are summoned by the Governor when necessary. A board of assessors consisting of the Secretary of Native Affairs, the district governors and the county chiefs meets annually to make recommendations to the Governor concerning the number of native officials and their salaries. There is an education board composed of three Samoans and three Americans. To prevent Samoan discontent about financial matters—which became acute in 1920—an auditing board comprising three Samoans and three white officials examines the official monthly accounts.

Justice in Western Samoa

Many of the institutions of justice, including the local courts, remain much as in German times, but the former German Imperial High Court in Apia has been replaced by the High Court of Western Samoa. This court is presided over by a Chief Justice—his functions at present being performed by a magistrate from New Zealand who makes periodic visits to Samoa. Appeal may be made from the High Court in Samoa, subject to the approval of that body, to the Supreme Court of New Zealand. The jurisdiction of this latter court also extends to Samoa in civil cases and in criminal cases when the offender is apprehended in New Zealand. The Chief Justice is aided by three Samoan associate judges in the High Court, each of whom is appointed to try cases with him in rotation. The associate judges have in practice shown considerable interest in their duties, and it frequently happens that the two not trying a case will attend as observers. Trial by jury is not in force in Samoa, but in criminal cases involving the death penalty or imprisonment for more than five years, four assessors selected from a panel of responsible citizens are co-opted. To secure a conviction at least three of these assessors must agree. European as well as native inhabitants are subject to the High Court.

The Secretary for Native Affairs at Mulinu'u and the Resident Commissioner of Savai'i have jurisdiction in criminal cases where

the prescribed punishment does not exceed £10 or one year's imprisonment. A series of local native courts presided over by *Fa'amasino*, native district judges, deal with civil cases between natives involving values up to £5, or offences involving a fine of not more than £2. *Pulenu'u* have local jurisdiction and can impose minor penalties for breach of local legislation.

A special court, the Land and Titles Commission, constituted to deal with questions of ownership of land, and of succession to chiefly titles, is a direct descendant of the commission set up by the Treaty of Berlin to settle disputes between native and other claimants to land. In 1920 this body consisted of the Chief Justice and from eight to ten Samoan commissioners selected from a list of the jury type. But in 1937 the commissioners were replaced by three associate judges who assisted the Chief Justice, and the title was changed at the request of the Samoans to the Native Land and Titles Court.

Laws in force in Western Samoa, originally promulgated by the Samoa Act of 1920, are in general similar to those of New Zealand. Specific regulations and ordinances of local importance have been added in recent years. Some of these, as village regulations, apply only to Samoans; others, as certain tax assessments, only to non-natives; others still, as the criminal code, traffic regulations and the prohibition of the import of alcoholic liquor, to natives and non-natives alike. (Under the permitted head of liquor for medicinal use, however, considerable quantities of whisky, gin, etc. are imported annually.) Other laws govern relations between Samoans and Europeans; these include prohibition of the alienation of native land, and regulations governing commercial transactions. In addition, there is legislation covering the control of Chinese indentured labour.

Justice in American Samoa

Except for naval personnel, who are under the discipline of their own service, jurisdiction in American Samoa is vested in a High Court presided over by the Governor or his nominee, assisted by two associate judges, one American, the other Samoan. This court deals with all major civil and criminal suits, and from it there is no appeal. Below this are six district courts presided over by a native judge acting with an American judge who has the power to overrule his native colleague's verdict if he disagrees with it. Their jurisdiction extends to all minor civil suits and offences of non-natives; to civil

actions between non-natives and natives; to all civil actions between natives where the amount involved exceeds ten dollars; and to appeals from village courts. Owing to difficulties of communication and the monthly session of these district courts, a practice has grown up whereby the American judge resides in Pango Pango and presides over the district court there, while the findings of the native judges in the outlying courts are forwarded to him for concurrence.

Thirty-five native village courts deal with petty offences. A local feature of the system is that 40% of all fines up to a maximum of $8 per month are returned to the native magistrate as salary, and smaller percentages to the native clerk of the court and the village policeman. The practice was obviously introduced to prevent the traditional Samoan tendency to overlook offences not contravening ancient Samoan customs. In spite of the obvious risk that such a system might lead to excessive zeal on the part of the court, it appears to work well.

Land and title claims, which are dealt with by a special court in Western Samoa, are settled in American Samoa by the High Court. An attempt was made in 1930 to transfer the consideration of these claims to a purely native tribunal. Samoan litigants, however, showed great reluctance to bring cases of this kind before an all-native court where the judges might well be interested parties, and the scheme was dropped.

Laws are generally similar to those in Western Samoa, but since there are far fewer non-native inhabitants to complicate legislative problems, they are simpler.

Samoan Custom and the Law

The bulk of litigation in both American Samoa and Western Samoa is taken up with land or title claims. Succession to almost every title is disputed. This is characteristic of the indeterminate elective process by which the holder of the title of *matai* or head of a family was formerly chosen by the general will of the influential members of a family group.

The attitude of Samoans as a whole towards white laws and the white judicial system is apt to be one of distrust, especially as regards the classification and punishment of offences. Under the old Samoan institutions there are offences against men of rank and against the community in general which are not recognized by the modern law—as a ritual insult to a travelling party, or building a house with more

platform steps than that of the highest chief in the village. So also there are methods of punishment or atonement which are foreign to European conceptions—destroying the property of an offender, or humbling oneself ceremonially before the offended party. And Samoan punishments vary in severity according to the rank of the offender and the person offended. The more rigid individualized character of European law is directly opposed to these Samoan ideas, which in essence take in the implications of the offence for the community, and attempt to heal overtly the breach that has been caused. Hence, while in many matters the Samoans appeal to the courts that have been set up by the administration, in others they tend to employ their own native machinery. In Western Samoa, particularly, the administration has looked on this with tacit approval. Even in the local courts it is symptomatic that the *Fa'amasino* (native judges) have often been inclined to decide cases in the light of Samoan custom rather than according to English law. While a weakness from the judicial point of view this has had the merit of tending to smooth out the transition from one set of institutions to another. The advantages of a flexible system are especially desirable at the present day, when many Samoan customs are breaking down among the younger people who as yet have not fully grasped the responsibilities and codes of the new order.

Land Policy

In the early days large quantities of land had been acquired from Samoans by Europeans for plantation purposes. In many cases the considerations offered in exchange were meagre and impermanent, such as firearms or liquor. The situation was complicated by cases in which the land was sold twice, and by the absence of any effective system of defining the boundaries of land sold.

Conflicting claims to the ownership of land played no small part in the international rivalry in Samoa. It was for this reason that in the Berlin act of 1889 the three Powers concerned agreed to special clauses dealing with land problems. In order that the Samoans might keep their lands for cultivation and for their children after them, all further alienation of lands by natives to non-natives was prohibited. Two exceptions to this rule were made. Land within the Municipality of Apia could be sold or leased with the approval of the Chief Justice, and agricultural land elsewhere could be leased for a period not exceeding forty years. Further, a land commission was set up to

investigate claims and titles to land. All further land legislation after the partition of the group into Western and American Samoa was to be based on this original agreement.

In American Samoa the work of the original land commission set up by the Berlin Treaty is carried on by the American judge assisted by Samoan advisers. All *matai* titles, that is to say titles to land which are held by virtue of the headship of a family, must be registered. Land may be leased to foreigners for a period of up to forty years with the approval of the Governor, but direct alienation to non-natives is forbidden. It is, however, possible for half-caste children of Samoans legally married to non-natives to inherit land, and in this way land can pass out of native ownership.

In Western Samoa all alienation of land except with official approval was forbidden in 1900, but in 1905 an area round Apia covering some 7 sq. miles was defined as a Plantation District. Land in this area could be sold with the Governor's consent. Further, all land outside the area could be acquired by the Governor provided that the food plantations of the natives were not unreasonably diminished.

At the beginning of the period of New Zealand administration, all land held by Samoans by native title was vested in the Crown as trustee and declared native land. The usual provision for leasing land for periods up to forty years is made, but the government makes itself responsible for the collection of rent on behalf of the owner in such cases.

Land held by Europeans who were not ex-enemy aliens is known as European land and held in freehold. Lands belonging to former German subjects, including the whole of the holdings of the Deutsche Handels- und Plantagen-Gesellschaft, were confiscated for reparations and administered separately as Reparations Estates. From time to time small grants of this land have been handed over to native villages for a nominal payment. In 1931 a large area amounting to 18,000 acres of bush land in the Falealili district of Upolu was returned to natives without charge. Distribution of these major types of land is shown in Fig. 190. In 1925 a scheme was adopted of leasing small tracts of Reparations Estates at a nominal rental to indigent part-Samoans, and in 1936–7 the administration undertook a land settlement scheme on their behalf. Allotments were held on 33-year leases at a rental of 3*s*. per annum, renewable for two further terms at reassessed rentals. The scheme has proved successful, and the settlers grow bananas, cocoa and vegetables, and live in European fashion.

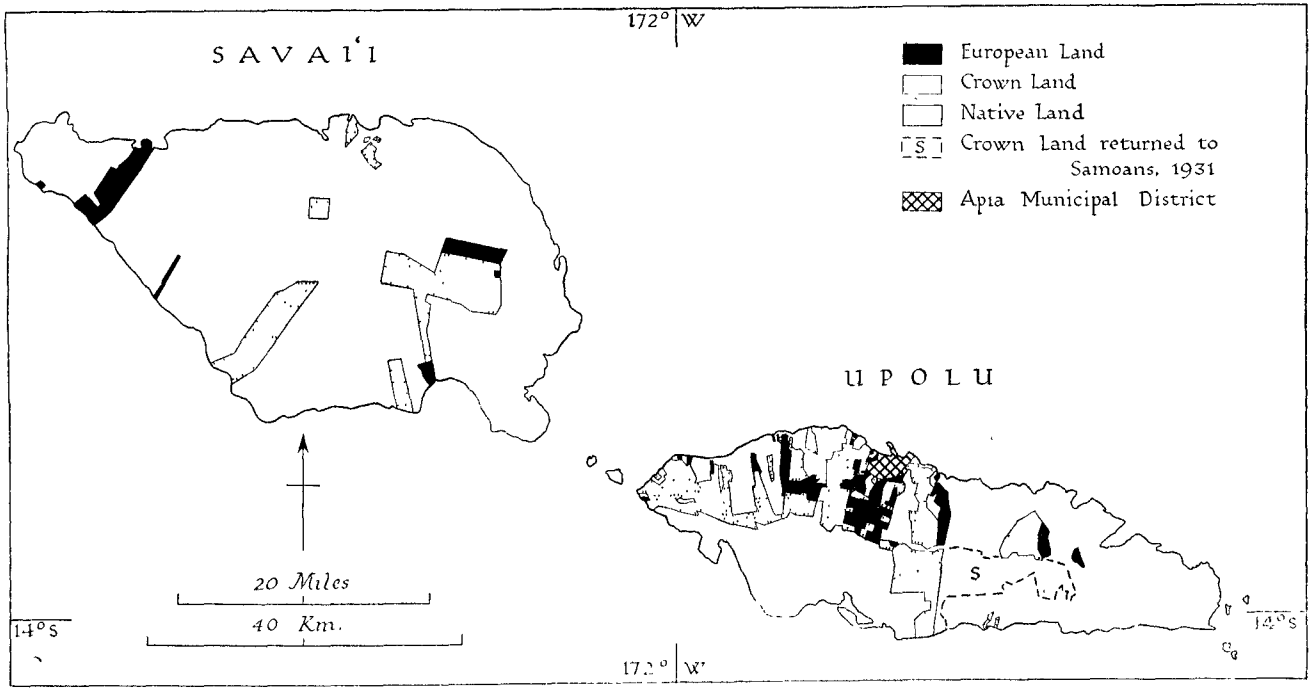


Fig. 190. Land holding in Western Samoa

The areas shown as Crown land include small public reserves and the large Reparations Estates (Crown Estate Order Lands). Based on: (1) Lands and Survey Department, Samoa, maps nos. 1 and 2; (2) F. M. Keesing, *Modern Samoa*, pp. 262, 264, 265 (London, 1934).

Certain difficulties have arisen over the ownership of native land in modern conditions. Conflict has at times developed between the owner of the *pule* of land, that is, the remote and possibly ceremonial ownership which is nominally in the hands of a *matai*, the head of a family, and the actual occupier of the land. Both in Western and American Samoa the official policy has been to support the actual occupier. Similarly, an experiment was made of granting, through the district council, 5-acre plots to *taulele'a* (i.e. non-titled) adults. The process has been slow but the tendency seems to have aimed steadily at a gradual change from collective ownership of native land to individual ownership.

Finance in Western Samoa

A problem in all small dependencies like Samoa is that the native population cannot provide a revenue sufficient to pay for the services necessary for development. The gap between native revenue and expenditure can only be met by differential taxation for the white population and on occasion by subsidies.

Germany had to subsidize Western Samoa until 1908, but after that date the territory was self-supporting. Native taxation consisted of an annual levy of 20 marks on all adult males. Chiefs had to pay four marks more. There were also graded income taxes, and taxes on real property and a $12\frac{1}{2}\%$ *ad valorem* tax on all imports. An export tax on copra and cocoa had been authorized in 1914 but was not enforced before the New Zealand occupation.

Under mandatory government subsidies and grants averaging about £20,000 per year were made till 1931. A total of £200,000 was obtained by borrowing, of which about £80,000 has been repaid. Revenue is obtained from the native population by a poll tax on all adult males, gun licences and dog licences, and by a special medical tax consolidated with the poll tax at a rate of £2 for chiefs and £1. 16*s*. 0*d*. for commoners. Europeans pay a graduated salary tax, a building tax, water rates and various licence fees. From 1 April 1941, a graduated store tax was introduced on business turnovers, to replace a flat-rate store tax previously payable by general storekeepers only. A personal tax of £1. 5*s*. 0*d*. per head was abolished in 1936.

A customs duty is imposed on all imports except books, medical supplies, infant foods, insecticides and a few other specified articles regarded as being of particular social or economic importance. There

is a $7\frac{1}{2}\%$ preference on British goods. The actual rate of the duties has varied from time to time, but in 1939 it was $17\frac{1}{2}$ and 25% on British and foreign goods respectively. Export taxes have been placed on the major products; in 1939 they were levied on copra (£1. 10*s*. 0*d*. per ton), cocoa (£2. 0*s*. 0*d*. per ton), bananas (3*d*. a bunch or 6*d*. a case), rubber and *bêche-de-mer*.

The average of both revenue and of expenditure over the ten years ending in 1941 was approximately £100,000 per annum. In 1940–1 revenue amounted to £107,980, and expenditure to £111,353. The principal sources of revenue were: customs receipts, 76%; receipts from public undertakings, 5%; postal receipts, 7·5%; payments towards health services, 5·7%. The major items of expenditure were: health services, 25%; education, 9%; native affairs, 9·25%; public works, 13%; debt charges, 8·7%; and treasury and customs expenses, 9%.

Finance in American Samoa

The finances of American Samoa are on a smaller scale than those in Western Samoa. The islands are smaller, their population, resources and trade are far less. The interest of the United States in these islands is purely a naval one, which leads to the free and lavish use of naval personnel and equipment in administration and in development projects.

Taxes levied directly on Samoans include gun, dog, and bicycle taxes, marriage fees, an educational tax and a poll tax. The education tax in 1930 was $3.50 and the poll tax $6.50 per head. Formerly the latter was paid in copra. An annual tax is also raised on the values of all real property. Direct taxes collected from non-natives include licences, fees of various kinds, and a poll tax similar to that which is collected from the natives. Customs duties consist of a flat *ad valorem* rate on the majority of imports, with specially heavy rates for some articles and exemptions for others.

The revenue collected in 1930 amounted to about $130,000. Of this, 16·5% was obtained by direct native taxation and 71·5% from customs dues, etc. Out of an expenditure of about the same sum, 36% was spent on customs and harbour expenses, 19·5% on public works and 9% on health.

In 1941, however, the estimated revenue had fallen to $89,000 and expenditure to $96,000. These figures do not take into account a sum of $8,100,000 allotted by the United States to the territory to provide bomb-proof shelters and facilities for the operation of aircraft.

SOCIAL SERVICES

Health

The average Samoan is a robust person. He does not work too hard, his houses are open and clean, his diet is simple and abundant, and the climate is equable. The standard of health in Samoa might reasonably be expected to be high. But certain indigenous diseases are common, among them being filiariasis (elephantiasis), skin affections of various kinds, yaws, conjunctivitis, and hookworm. Moreover, long immunity has made the Samoans particularly susceptible to European diseases. The influenza epidemic of 1919, for example, killed several thousand people, and measles, when it occurs, is serious. The gradual adoption of European houses, especially in and round Apia, and the irregular wearing of European clothing, have encouraged diseases of a respiratory character. Pulmonary tuberculosis is particularly common. A malignant jaundice, possibly akin to yellow fever, and occasional cases of leprosy occur.

The conservatism of the Samoans and the belief that many complaints are of a supernatural origin make it particularly difficult to induce the natives to give up long-established practices and avail themselves of European medical facilities. The administrations have therefore had the double problem of providing adequate medical facilities and of educating the native population in the use of them.

Medical Services in Western Samoa

The New Zealand government on assuming the mandate found in existence an efficient medical service with a large main hospital in Apia, built in 1903 by the Germans. Doctors on the staff of the German hospital made periodical educational tours through the islands and introduced health measures, including vaccination. On this foundation the New Zealand administration built extensions to the hospital at Apia, established a dental clinic, and built branch hospitals at Tuasivi and Aleipata, with out-stations in charge of a native medical practitioner or a Samoan nurse at villages in both of the main islands of Upolu and Savai'i. Medical supplies, usually the harmless universal panaceas, Epsom salts, castor oil, and iodine, were distributed to wives of pastors in most of the villages.

Provision of a wholesome supply of drinking water for most villages is a measure which may be considered as a health service.

Certain villages, particularly in western Upolu, obtain water from a piped supply; others by catchment or from springs. Cisterns of iron, concrete or redwood have been provided very liberally. Latrines have been built, formerly projecting over the sea, but recently of the more efficient pit type.

In 1941 the European medical staff consisted of three doctors, a dentist, a bacteriologist, and ten nurses. There were also sixteen native medical practitioners, nine cadets and seventy-eight native nurses and probationers. Two locally born Europeans were being trained as bacteriologists and five Samoans as dentists. Perhaps the most striking feature of the system is the employment of native medical practitioners. Certain promising pupils from the schools are selected for employment as laboratory assistants or for preliminary training as cadets. After a course of training in the hospital at Apia, the cadets are sent for a four-year course to the Central Medical School at Suva in Fiji. After completing this course they return to Samoa and are posted to out-stations or district hospitals.

Girls are recruited and trained in Apia as nurses and in some cases posted to out-stations. There is a considerable retirement of nurses because they soon marry. But though no longer in the service of the government, when they settle down in the villages they usually serve on the local women's committees and help to dispense knowledge of European medical practice.

Educational drives have been made from time to time with the aid of films and through the medium of the local newspaper, to make the people health-conscious. Sanitary arrangements and regulations of various kinds have been introduced and approved by the native council, the *Fono* of *Faipule*.

Most villages now have a special women's committee consisting of the pastor's wife, the wives of the principal *matai* (chiefs), and retired nurses; each committee deals with the health of the village in general and with child welfare in particular. The committees receive periodical instruction from travelling doctors and nurses, and the movement has been popularized by inducements such as bright uniforms.

A system of a standard tax of £1 per adult male of the population was introduced in 1923 to replace the previous method of direct payment for medical services. The immediate effect of this was to encourage people to seek medical aid. However, in the disturbed conditions resulting from the *Mau*, this tax could not be collected, and temporarily direct payment had to be re-introduced.

Government expenditure on health services has always been a large item. In 1927, for instance, the expenditure on these services was £25,912, while revenue from the health tax and fees from the non-native population amounted to £10,732. The remaining £15,000 odd was provided by a subsidy from New Zealand. In 1940–1 expenditure on health was £27,800, while revenue was £6,200, the difference being met by revenue collected from other sources.

Medical Services in American Samoa

From the very beginning of their occupation, the Americans have taken a great interest in improving health conditions. The same general conditions obtain as in Western Samoa, and the steps taken to solve the problems have been similar.

A hospital for native Samoans was built at Pango Pango in 1900 and naval stores were used to equip it. This has been expanded and four small stations have been built. In addition, there is a naval hospital for service personnel. The white staff of the medical service, thirty-two in all, are all naval personnel. They comprise three doctors, one dental officer, one chief pharmacist, four nurses and a number of naval ratings who act as laboratory assistants or as district sanitary inspectors. Samoan men have in a few cases been enlisted in the United States navy and trained as sanitary inspectors. Samoan girls have been trained in large numbers as nurses and distributed through out-stations. But just as in Western Samoa, trained nurses are in much demand as wives and the retirement rate is consequently high. Where American practice differs from that in Western Samoa is chiefly in the absence of any provision for native medical practitioners.

Instructional propaganda in health matters has been most successful, and most Samoans in the eastern area are very interested in health measures. All Samoans who undergo treatment in the American hospital are not only given medical treatment but also elementary instruction in hygiene. In 1910, following the discovery that 85% of the population were suffering from hookworm, a special meeting of chiefs was called to consider the problem. This was the beginning of an intensive propaganda drive. This campaign includes frequent tours by the Governor, health officer and sanitary inspectors; articles in the official local paper; speeches on ceremonial occasions; and the organization of women's committees in the villages, which are provided with simple medical supplies in the care of the chief or other

man of influence. An elementary text-book on hygiene is also issued for use in schools. Stringent laws forbidding old Samoan medical practices have been promulgated in the hope of breaking down the conservative superstitious approach of Samoans to disease.

Bearing in mind the small size of the territory and the numbers of the population, the service is probably one of the most intensive in the world. Originally a small charge was made for medical treatment but this has been removed following a request from the Samoans, and the treatment of native Samoans is free. The estimated cost of medical services in 1930 was $95,000 or $9·75 per head. The actual cost to Samoans works out at a little over a dollar a head per year. The expenditure is low for the amount of work undertaken, and could only be achieved by the bulk purchase of medical stores and equipment possible to a large organization such as the United States navy.

Education in Western Samoa

Under the German administration the mission schools had been allowed to continue their activities and were even given a small subsidy. Under this scheme every Samoan church had its village school under the pastor or catechist, and there were certain more advanced schools and training colleges run by the four principal missions. A private school for non-natives in Apia was taken over by the government and still caters for white and part-Samoan children. A government high school was also built at Malifa behind Apia primarily for the purpose of training Samoans for minor official appointments; German was taught there.

When the New Zealand civil administration took over the government after the war of 1914–18, a scheme was prepared for the establishment of some eight undenominational boarding schools throughout the territory, but this met with opposition from both missionaries and settlers. A series of negotiations followed. The outcome of these was that a scheme was evolved in which full use of the existing missionary schools and the former German schools was made. To-day the system of education consists of several grades of schools based on the village schools and reaching a pinnacle in the government Central School at Avele near Apia.

In every village there is a pastor's school (Grade I) under the full control of the missions, for children between the ages of five and ten. They are taught Samoan and a certain amount of reading, writing and arithmetic. In all there are about 300 such schools with a total

attendance of about 10,000 children. Grade II schools, which are district mission schools, are a combined enterprise. They are usually under the local control of a mission pastor and the buildings are provided by the mission or the villages where they are situated, but the teachers are trained and paid by the government. The curriculum includes elementary English. There were ninety-five such schools in 1941 with a teaching staff of 195 and 11,475 pupils. This is more than double the number of schools, teachers and pupils in 1936. Children are drawn not only from the immediate villages but also from all villages within easy walking distance. Above this are Grade III schools, which are government or mission boarding schools. Selected pupils from the Grade II schools may go either to the government Grade III schools at Malifa in Upolu or Vaipuli in Savai'i, or to one of the mission schools. The government schools pay great attention to agriculture and other activities of a practical nature, and the most promising pupils from these schools go on to the Central School at Avele. The corresponding mission schools have tended to become training schools for entrants to the mission colleges.

The whole educational system is administered by a Superintendent of Schools with an advisory board consisting of government officials, representatives of the various missions and one of the *Faipule*. The three government schools have white headmasters, but the policy has been to train as many native teachers as possible. Certain promising teachers have been sent to New Zealand for courses. A new Teachers' Training College was established in the grounds of the school at Malifa in 1939, and by 1941 fifty teachers were being trained. Annual refresher courses for teachers are also held.

Education in American Samoa

Missionary activity has always been far less in the islands of Tutuila and Manu'a than in Upolu and Savai'i. A convent school had been set up at Leone in 1897, and various mission schools were built in the next ten years.

The American administration established a public school for white and native children at the Naval Station, and in 1904 subsidized a school at Manu'a. In 1911 the Governor appointed a board of education, standardized a curriculum, and made attendance at the village mission schools compulsory for children between six and thirteen years of age for four days per week.

Following a request by the Samoans in 1921, government schools of two types were established. The primary schools correspond to the pastor schools and the Grade II schools of Western Samoa. Intermediate schools correspond to the Grade III schools of Western Samoa. Both types of schools are undenominational. But the Roman Catholics maintain a separate school at Leone and the Mormons one at Mapusanga. The pastors objected to the withdrawal of children from their schools to the government schools with the result that children in some communities were made to attend both types.

Villages, as in Western Samoa, were expected to provide school buildings, but teachers were provided by the government. In 1930 there were twenty-one state schools in the territory, one within walking distance of every village, and education was made compulsory from the ages of six to seventeen.

The whole system was modified in 1932 as a result of a bequest by an American philanthropist—known as the Frederick Duclos Barstow Foundation. A committee to administer this fund cooperated with the Samoan authorities and the outcome was that the pastor schools were recognized again, three Hawaiian teachers were sent annually to Pango Pango to conduct a teachers' training course, and a special school, the Feleti School, was established to train Samoans along modern educational lines.

The naval chaplain at Pango Pango acts as Superintendent of Education. He presides over a board on which are three Samoans, one from each district, and has subordinate to him a Director of Education who is responsible for organization and inspection.

Other Services

Other services of note in Western Samoa include the Agricultural Department and the Apia Observatory.

The Agricultural Department supervises all cultivated lands, issues licences to buyers of copra, and maintains the standard of copra and cocoa by frequent inspections. An Agricultural School at Avatele serves not only as a training centre for Samoans but also as an experimental station where new food crops and improved agricultural methods can be tested.

The Apia Observatory situated near the end of the Mulinu'u peninsula was established in 1902 by the Society of Natural Sciences of Göttingen to take observations simultaneously with those of an Antarctic expedition, but it proved so valuable that it was retained

by the German government. It was later taken over by the New Zealand government, being placed under the control of the Department of Scientific and Industrial Research in New Zealand in 1928. Equipment includes seismographs for recording both vertical and horizontal earth movement, and changes in terrestrial magnetism are also recorded. Special researches into the upper air have been undertaken, and reports on weather conditions are transmitted twice daily.

Missionary Activity

Both American and Western Samoa allow complete freedom of conscience in religious matters, but the administrations of both territories impose restrictions on setting aside land for church purposes and on church building. Nevertheless some mission buildings are among the most notable structures in the islands (Plate 121). Missionary activities are undertaken by the London Missionary Society (Congregationalists), Methodists, Roman Catholics, Mormons and Seventh Day Adventists. In the past the Protestant missions divided the people into full members of the church and into adherents who nominally supported a given church but did not follow all its precepts. This difference has tended to disappear under modern conditions.

The most powerful organization, the London Missionary Society, has about 30,000 adherents. They are spread throughout the whole group. For purposes of administration each village community, with its church and pastor, has its group of elders. Groups of villages form sub-districts with a council of pastors and elders, and a group of three or four sub-districts form a district, also with its council. There are altogether eight districts, four in Upolu, two in Savai'i, and one each in Tutuila and Manu'a. An annual great council (*fono tele*) is held in Malua, the mission headquarters (Plate 122), where representatives from all districts gather. Until 1929 ultimate control lay with the four white missionaries. In that year an experimental constitution was introduced in which six Samoan representatives elected by the *fono tele* sat with the four white missionaries. Samoans are also represented on sub-committees dealing with overseas missionary activity, finance, etc. Apart from its purely domestic religious functions the society has established a training college at Malua, and a considerable number of Samoans trained there have been sent to other islands. The part played by the London Missionary Society and other missionary bodies in education has already been mentioned (p. 591).

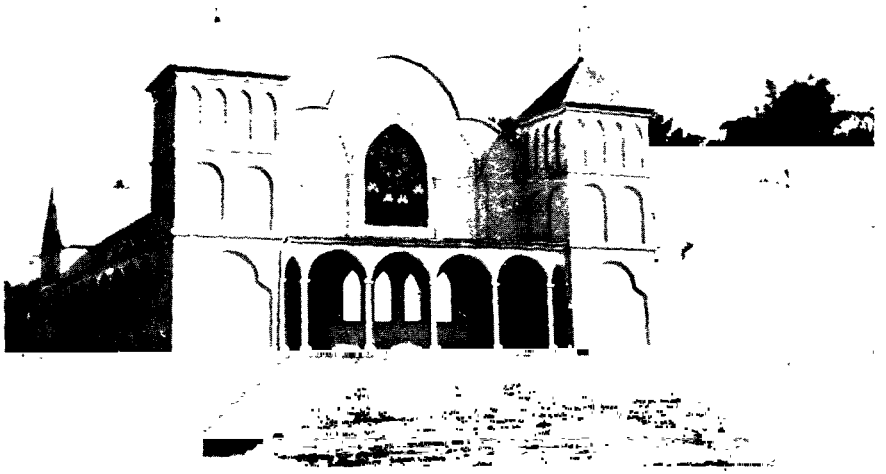


Plate 121. Sapapali'i church

An outstanding landmark on Savai'i as one sails through Apolima strait.



Plate 122. Mission house at Malua, north Upolu

The wooden building, with wide verandah, corrugated iron roof and garden, is typical of many European dwellings in Samoa.



Plate 123. Apia from the sea

The main commercial centre is along the sea front. The hill behind the town is Mt Vaea, and the large white building beneath it to the left is the Catholic church.



Plate 124. Pango Pango on boat day

A scene when a liner arrives. Baskets, dancing dresses and other objects of Samoan craftwork are displayed for sale around a Samoan house, against a background of European buildings.

The Methodist Mission has about 7,000 followers. Native Wesleyans from Tonga actually settled in Savai'i in 1828, two years before the arrival of John Williams in Upolu. The mission was withdrawn to prevent inter-denominational competition with the more successful London Missionary Society, but in 1857 it was found that the tenets of Methodism persisted so strongly that it was decided to reintroduce teachers. The body later controlling this task was the New South Wales Methodist Conference. Its organization and religious activities are on the same lines as those of the London Missionary Society. But they have not allowed the same degree of self-government in the annual synod which is a feature of the Congregationalist organization. The New South Wales Methodist Conference has power to veto resolutions of the synod.

The French Marist Society brought Roman Catholicism to Samoa in 1845. They too have a total following of about 7,000 people. Unlike the Congregationalists and the Methodists, though they have spread over the whole of Samoa they have confined themselves to intensive work at a few centres, with headquarters at Moamoa, near Apia. They have made special efforts to proselytize the part-Samoan population. The mission has a considerable European staff. In 1934 this numbered about 16 ordained priests and over 40 lay brothers and sisters engaged in educational work. In addition there were, at the same period, a number of native Samoan priests and sisters and over 100 catechists. The mission is controlled by a resident Bishop whose see includes the Tokelau islands and is known as the Vicariate Apostolic of Western Samoa.

In 1888 Mormon missionaries settled in Samoa and eight white elders established three centres. Like the Roman Catholics, they made no attempt to spread throughout the islands but contented themselves with intensive work in a small area. Their followers do not number more than about 1,200. Seventh Day Adventists have also established a mission in Samoa, but the 1926 census showed that their converts only numbered 27 and they have not made much progress since then.

The effect of mission activities on the Samoans has been complex. In many externals, such as strict sabbatarianism, rigid church attendance, family prayers in the evening, the free use of Biblical references in everyday conversation, monogamous marriage, the people have followed the mission teaching. In other respects, as in ideas of supernatural causation of disease, private sex behaviour, and some aspects of birth and marriage ritual, they have clung to their old beliefs and

customs. The church organization provides them with a framework for village co-operation, and for the expression of wider, even national interests. But within this, old rivalries persist and competitive jealousies find new outlets. In short, Samoans have to a large extent fused the institutions of Christianity with their own culture, and absorbed them, rather than changed their culture to conform with the spirit of its doctrines.

ECONOMICS

The main products of Samoa to-day are cocoa, bananas and copra, the greater part of the latter two being in native hands. There are no known sources of minerals in any part of Samoa, although from time to time rumours have been current that radium had been discovered during the period of the German occupation.

AGRICULTURE

In Western Samoa in the early days of development a considerable amount of land, especially on Upolu, was acquired by Europeans and devoted to the preparation of coconut oil and, later, copra. Experiments have been made from time to time in the production of such commodities as rubber, pineapples, coffee, tobacco and vanilla. These have not been very successful. Rubber might have been the most suitable of these crops had it not been for the competition of Malayan rubber. Some idea of the produce of plantation land in Western Samoa can be obtained by a table published by the Administrator in 1928.

Type of plantation	Area in acres				
	Copra	Cocoa	Rubber	Bananas	Cotton
Properties held by Reparations Estates Service	8,598	1,406	2,072	255	—
Properties leased by Estates to private owners	1,371	1,736	—	—	20
Private plantations	2,066	791	—	71	—
Reverted to native holders	—	—	480	—	—
Total	12,035	3,933	2,552	326	20

This table does not take into account purely native land, and a large area of the Reparations Estates has since been returned to native

ownership. But the table shows the limited nature of European holdings (since the Samoans hold nearly 600,000 acres) and the relative importance of the major commodities. Native holdings are used for the greater part of the copra production and in recent years for bananas, which have been grown under government encouragement for export to New Zealand. A large amount of the native land is utilized for growing taro, breadfruit, arrowroot and other crops for home consumption. Pigs and fowls play a large part in the native economy, and a few cattle are also kept.

In American Samoa, where almost all agriculture is in native hands, the only product for export is copra. A few cattle are kept in western Tutuila. American census returns for 1930 showed the following figures: cattle, 606; horses, 215; pigs, 5,170; fowls, 16,108; ducks, 667.

Copra

Copra, the major industry of the group, replaced the collection of nuts and extraction of coconut oil soon after 1870. In the early days the copra supply was limited and irregular. In order to secure a steady supply, European traders began to acquire land. The Godeffroy company under the able and energetic direction of the local agent, Theodor Weber, soon became the biggest single land holder. But considerable quantities of copra were still purchased from native producers. Under German rule, copra planting was encouraged and legislation was introduced compelling every *matai*, as head of a family, to plant at least fifty coconut palms a year; Samoan coconut plantations were considerably extended as a result, but the actual production of copra did not increase very greatly. Copra production in 1899 was 7,792 tons; in 1913 it had risen to only 9,637 tons.

Since the Germans found the Samoans unsuited by inclination for the hard steady labour on the plantations, they imported, under a system of indentures, Melanesians in the latter years of the nineteenth century and Chinese from 1903. The system continued till New Zealand took over the administration. Since then the policy has been discouraged; it was abolished in 1923 and replaced by a system of free labour.

While there are to-day some thirty-five European copra planters, the major part of the industry is in Samoan hands.

The New Zealand administration controls the purchase of copra in Western Samoa by issuing copra buyer's licences to suitable traders and limits the sale of copra to certain days of the week. An ordinance of 1923 forbids the marketing of poor quality copra.

In American Samoa official efforts to stimulate copra production began in 1903. Native officials were appointed as plantation inspectors and road supervisors, but their efforts have not been very effective. The same factors of Samoan conservatism which handicapped the German authorities in Upolu and Savai'i were operative. Prior to the war all copra was marketed by the government and disposed of under contract in the United States.

In Samoa the preparation of copra is simple; nuts are merely picked up from the ground where they have fallen and broken open. The meat of the coconut is scooped out (Fig. 188) and dried, either in the sun or in kilns. Palms start bearing after six years' growth, but full maturity is not reached for fifteen years. The average yield is from seven to ten hundredweight of dried copra per acre, but may rise to a ton in favourable circumstances. The most fertile copra-growing region is on the north coast of Upolu round Apia and Mulifanua, but scattered plantations occur everywhere on this island and on Savai'i and Tutuila. In the latter island the plantations, practically all native owned, are often small, varying in size from half an acre to about four acres. Production is influenced by market prices and to a less extent by hurricanes. Prior to 1930 production in Western Samoa amounted to about one-third of a ton per head of population, while in American Samoa the corresponding figure was one-fifth of a ton. (A comparative survey of the quantity and value of copra exports from Western Samoa, 1925–39, is given in Fig. 191.)

Cocoa

Experiments in cocoa planting began in Western Samoa in German times. A hybrid of the Criollo and Forastero, fine and coarse varieties respectively, proved well suited for the environment. The industry is very largely in European hands, although every encouragement is offered to native producers and a subsidy of £2 per ton is paid to the grower for a high-class product, fulfilling government requirements for 'Standard Grade Cocoa'.

Trees bear after about six years. About 200 can be grown upon one acre, from which the yield varies from 3 to 12 cwt. The total production in 1939 was 650 tons. (A review of exports, 1925–39, is given in Fig. 192.)

Bananas

Bananas have always been a subsidiary native crop, and about seven main varieties are found in Samoa. They are frequently grown

on new coconut plantations to give an immediate return as a catch-crop while the palms are maturing. To foster the native cultivation of fruit in the island dependencies, the New Zealand government built

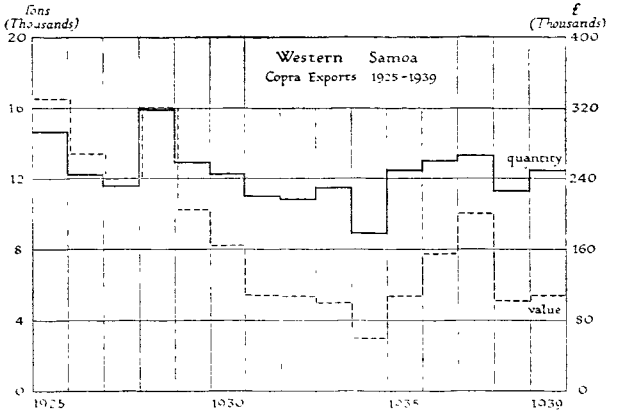


Fig. 191. Quantity and value of copra exports, Western Samoa, 1925–39
Based on *Trade, Commerce and Shipping of the Territory of Western Samoa for* 1939 (Wellington, 1940).

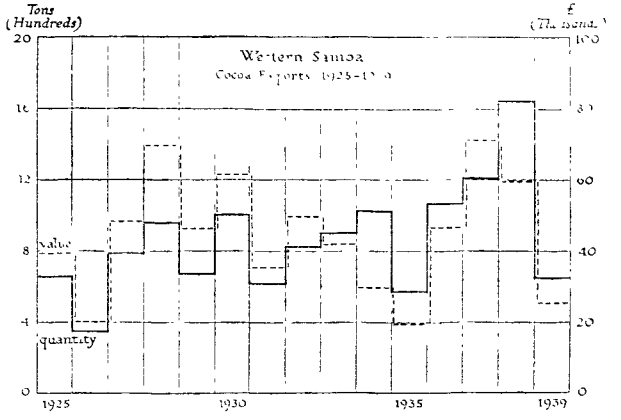


Fig. 192. Quantity and value of cocoa exports, Western Samoa, 1925–39
Based on the same source as Fig. 191.

the M.V. *Maui Pomare* of 1,203 gross tons; this vessel transports Samoan bananas to New Zealand. But there is considerable competition with Fiji in the New Zealand banana trade, and the amount

which may be exported in any year has been regulated by quota. Exports have risen steadily from under 1,000 tons in 1928 to about 7,400 tons in 1939, the average value exported over the last decade being £47,353 (Fig. 193).

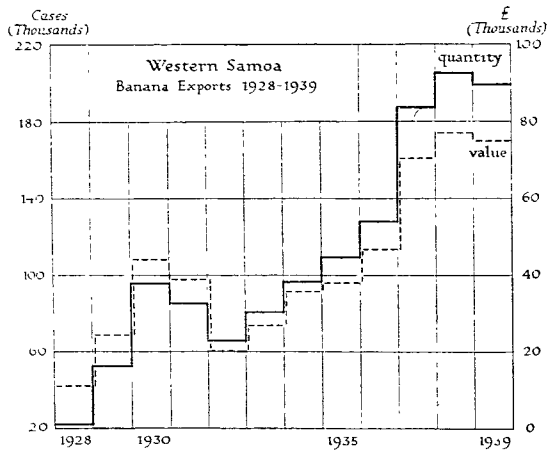


Fig. 193. Quantity and value of banana exports, Western Samoa, 1928–39
The export was very small before 1928. Based on the same source as Fig. 191.

Rubber

Rubber plantations have never been extensive. Although the environment is suitable, the competition of Malayan rubber and the low prices generally obtaining in recent years have prevented any great development of the industry. A modest start was made with a production of 2 tons in 1911. Production continued on a small scale till 1918, in which year no rubber was exported. In 1925 a slight rise in prices led to a renewed export which reached its maximum in 1928. In that year the government-owned rubber estates were abandoned altogether, although rubber continued to be exported until 1932. In 1935 rubber was exported again and the government recommenced work on their estates. Total exports rose to about 50 tons in 1939 (Fig. 194). Since the outbreak of war, everything possible has been done to increase production. In 1942 there were 46,500 trees on land owned by the Reparations Estates and large numbers of trees growing wild elsewhere. Production for the year 1941–2 was hampered by lack of labour to work the wild trees but amounted to about 75 tons.

Livestock

Practically all Samoans keep pigs and horses, and cattle of poor breeds are fairly plentiful. No attempt has been made to develop ranching. The horses are used mostly as pack animals in both American and Western Samoa.

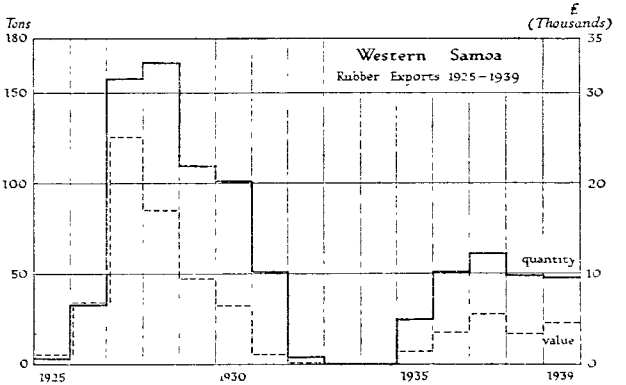


Fig. 194. Quantity and value of rubber exports, Western Samoa, 1925–39
Based on the same source as Fig. 191.

Manufactures and Handicrafts

Samoa is practically devoid of manufacturing industry. A factory in the Vailele district, owned by the New Zealand Reparations Estates, is engaged in the production of 'arrowroot' starch from cassava, which has been introduced. The produce of this factory is partly exported and partly consumed locally. In 1941 plans were approved for the construction of a factory to produce desiccated coconut.

Considerable sums of money have been made by the sale of native 'curios'. The greater part of this trade is in finely plaited mats of pandanus leaf. In 1939 'curios' to the value of £232 were exported from Apia and in American Samoa, where the opportunities of selling these articles to passengers in liners calling at Pango Pango are greater, the trade is more flourishing. In 1933 it was estimated that the average sales of these articles amounted to $12,000 per month. To-day quantities of these mats are purchased for the use of the United States army in tropical climates.

Labour and Employment

Until recently the subsistence economy enjoyed by the native Samoans has relieved them from the necessity of working for wages on European plantations. Plantation owners needing labour had to go elsewhere. In 1914 there were 877 Melanesians and 2,200 Chinese employed in Western Samoa. The military authorities started repatriating them, but after the war, in response to the urgent demands of the planters, further Chinese were recruited in Hong Kong.

To meet external opposition to the policy of indentured labour the Free Chinese Labour Ordinance of 1923 and the Labour Ordinance of 1933 were promulgated. Under these ordinances labourers signed a contract with the administration, represented by the Chinese Commissioner, for a three-year period. In actual fact many have elected to remain longer. But they are not allowed to remain for more than six years. (An exception was made in the case of those labourers imported by the Germans and long resident in the territory, to whom repatriation would be a particular hardship.) Labourers are free to change their employment, by application to the Chinese Commissioner, but are obliged to work during the whole of their time in Samoa. While there are no penal clauses in their contract, pressure may be brought to bear by arresting them on a charge of vagrancy. There has been no recent recruitment of Chinese and their numbers stood at 327 in 1941.

This decline implies an increase in the number of Samoans employed. There is a tendency, with the stimulus of the banana industry in native hands, for the younger people to work on a more commercial basis. Numbers have been attracted to Apia where they find employment as taxi-drivers, storekeepers, government clerks, etc. In American Samoa those recruited into the Fitafita guard are paid highly. One writer has stated that the force, only about seventy strong, draws pay equal to a third of the value of the whole of the copra crop of American Samoa. Owing to an attraction to the vicinity of Pango Pango to supply the various wants of the American navy, the villages round the bay have increased considerably in size.

Trade

Both in the value of its trade and in the wider range of its products Western Samoa is of far greater commercial importance than American Samoa. Whereas the per capita imports in 1938 of £3. 4*s*. into

Western Samoa and $15.2 into American Samoa show a larger trade for the latter per head, the per capita exports of £4. 3*s.* from Western Samoa and $8 from American Samoa show a great discrepancy in favour of the former territory.

During the ten years 1930–9, the average annual exports from Western Samoa were of a value of £223,795, and the average annual imports of a value of £179,650. The principal countries of origin of imports in 1939 and their value were, according to official statistics:

New Zealand	£62,498
Australia	38,113
United Kingdom	24,476
United States	20,157
Japan	10,873
Netherlands East Indies	9,986
Canada	8,444
Fiji	5,786
Burma	4,492
India	3,784
Other countries	6,127
Total	£194,736

About half the imports from New Zealand and about a third of those from Australia consisted of provisions—including tinned food, butter, sugar, and fresh or salted meat and fish. The import from Burma was entirely of rice. Other important items were: textiles and clothing, principally from Japan and the United Kingdom; timber, from New Zealand and Canada; metal goods and machinery, mainly from the United Kingdom, Australia and the United States; and petroleum products, largely from the Netherlands East Indies.

Exports in 1939 were very largely made up of the three commodities: copra, 12,536 tons, with a value of £108,078; bananas, 199,905 cases, with a value of £74,965; cocoa, 650 tons, with a value of £25,151. Smaller quantities of rubber and hides were also exported, and some general merchandise was re-exported to other Pacific islands. The destination of the principal exports in 1939 is shown in Fig. 195.

The war has caused considerable disorganization in the usual channels of trade, but large quantities of foodstuffs have been diverted to American Samoa to feed the many additional labourers brought in for the improvement of the Naval Station at Pango Pango.

Trade in American Samoa is mainly with the United States. Imports in 1938 amounted to $194,138, and exports to $102,818, the latter comprising copra ($55,300) and native handicrafts, mainly pandanus mats, ($47,500). The export of copra in 1939 amounted to

747 tons. The average price per ton on the dock at San Francisco was then $31.36, but there have been subsequent changes.

Neither territory of Samoa has a local currency. In Western Samoa the pound is the major unit, with an exchange rate at par with the New Zealand pound; in American Samoa the dollar is the major unit. Banking facilities are limited. The Bank of New Zealand has a branch at Apia, and the local Post Office operates a Savings Bank. In Pango Pango there is the Bank of American Samoa.

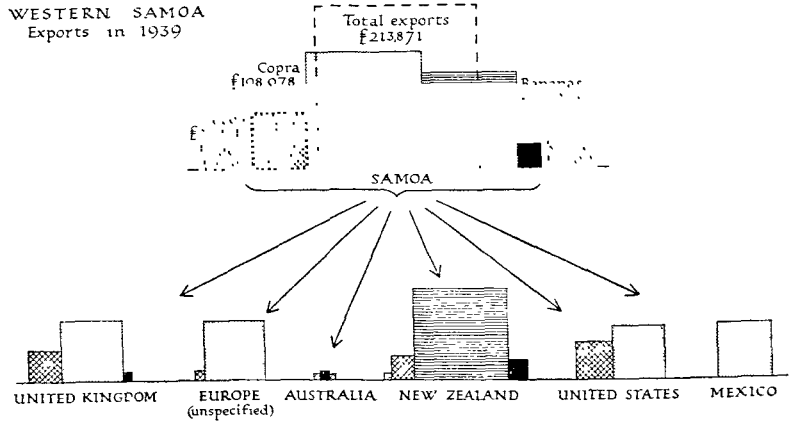


Fig. 195. Destination of exports from Western Samoa in 1939
Based on the same source as Fig. 191.

COMMUNICATIONS AND PORTS

Sea communications with Samoa are concentrated through the two ports of Pango Pango and Apia, where regular services (discussed under their respective ports) connect the group with Australia and the United States. Roads in the three larger islands are limited largely to coastal regions, while the interior of each is often served only by tracks or bridle paths. Upolu, with its greater commercial development and rather easier terrain on the north side, has a better network of well-made roads round Apia and along the north coast than is found in other islands.

W/T stations of high power are situated at Apia and Pango Pango, and small stations for local communication maintain contact between the more remote parts of Western Samoa and Apia. Parts of Upolu are also linked with Apia by telephone.

PORTS

The only two ports of any importance are Apia and Pango Pango, through which passes practically all the trade of Samoa. The former, while not providing either a very good or safe harbour, developed as a historical growth following on the early missionary settlement there. It was the most convenient point for the export of coconut oil and later copra, and as such became the headquarters of all trading activity and the administrative capital of Western Samoa. Pango Pango, though an excellent harbour, has but small commercial importance. It first came into prominence as a potential coaling station and port of call for the Webb shipping line in the latter half of the last century. But the whole basis of American interest in Samoa is strategic. The description of these two ports below is based on information up to 1939, but in 1941 considerable developments were reported to be in progress. Germany obtained treaty rights to Saluafata as a coaling station before she acquired western Samoa, but although it is the best harbour in eastern Upolu it has never been developed as a port.

Apia (Fig. 196)

Apia, lying in the middle of the north coast of Upolu, is a reef harbour in an open bay of roughly semicircular form about 1 mile across. Parts of the shore are fringed by coral reef and a barrier reef offshore provides slight protection from northerly winds. The disastrous hurricane of 1889 when three American and three German warships were driven ashore demonstrates the inadequacy of this in severe weather. The entrance is about 1,200 yd. wide with depths varying from 5 to 10 fathoms. There is an area roughly 16,000 by 12,000 ft. suitable for anchorage with a depth of more than 5 fathoms.

Wharfage. There are no wharves or quays alongside which ocean-going vessels can lie. Consequently, all loading is undertaken by lighters. There are two piers with a minimum depth of water of 4 ft.; these are known as the Customs Wharf, with a length of 200 ft., and the Tivoli Wharf, much shorter, and used primarily for passenger landings. There are no cranes or other mechanical loading appliances on them. There is also a small jetty.

Warehouses. The total warehouse floor space available amounted to about 94,000 sq. ft. in 1936.

This comprised the following:

	sq. ft.
Burns, Philp (South Sea) Co., Ltd.	11,900
Shell Oil Co., Ltd.	2,500
Morris, Hedstrom Ltd.	12,400
Vacuum Oil Co., Pty., Ltd. ...	6,500
O. F. Nelson and Co., Ltd. ...	18,900
New Zealand Reparations Estates	21,800
Market Hall	7,080
Customs Sheds	13,120

Supplies. The only oil stored is in drums, and the amount does not normally exceed 50 tons; small quantities of coal are kept.

Repair Facilities. There are no docking facilities, but there are five slipways capable of hauling out small craft up to about 15 tons. One of these slips is equipped with a railway track, but wooden rollers are used on the other four.

Communications. The New Zealand government maintains a regular service by the M.V. *Maui Pomare*, principally for the export of native-grown bananas. The Union Steam Ship Company also runs a regular service between Samoa, Tonga, Fiji and New Zealand. Small craft ply between Apia and Pango Pango to link up with American steamship services, and occasional cargo vessels call to load copra, cocoa or bananas. Figures for shipping entering and clearing Apia harbour in 1939 were as follows:

Nationality	Number	Tons	Cargo (tons)
Inwards: British	59	80,262	10,389
Foreign	39	32,074	2,831
Total	98	112,336	13,220
Outwards: British	59	80,262	19,865
Foreign	39	32,074	11,624
Total	98	112,336	31,489

Small craft normally based on Apia harbour and capable of coast-wise journeys of up to four days, consist of a pilot boat and fourteen privately-owned launches with cargo capacity from 4 to 26 tons and a horse-power varying from 10 to 45. There are also a few native-built long-boats.

Air communications, roads, and signal communications are more conveniently discussed under the headings of the various individual islands.

Electric Power. A small hydro-electric station provides power for the wireless station and for electric lighting purposes in Apia. The

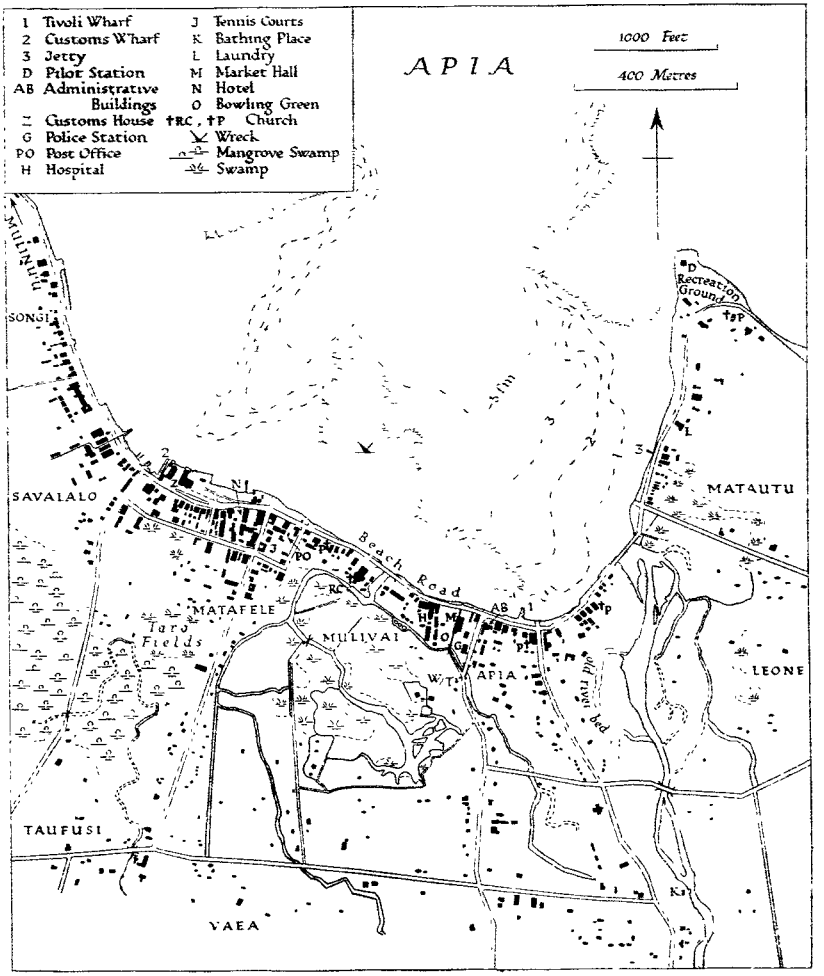


Fig. 196. Apia

Based on official sources of 1938.



Fig. 197. In a village on the shore of Pango Pango harbour

Part of Aua (Au'a) on the north side of the harbour; immediately away from the port Samoan village life begins.

Drawn by Aletta Lewis.

station consists of a turbo-generator driven by two direct-coupled water turbines. Distribution is by 2,200 V. alternating current underground mains, reduced to 110 V. 50-cycle alternating current for lighting, and to 400 V. three-phase alternating current for power purposes. In 1938 the station was more than ample for all requirements, and a stand-by set has been added to supply current in cases of breakdown or, if necessary, to boost the main generator.

Water supply for the power station is through a 6,000 ft. pipe-line from an intake near Vailima.

Town. The town of Apia consists of a narrow line of European buildings skirting the bay (Plate 123), gradually giving way inland to Samoan round or oval houses, each with its small plot of cultivated garden.

The population in 1936 consisted of the following:

Europeans	260	
Part-Samoans	1,000	
Samoans	4,000	(this figure included a few Melanesians)
Chinese	35	

A pilot station is situated at the extreme east of the bay; the Observatory is at the end of the Mulinu'u peninsula to the west. Beach Road is the main thoroughfare of the town, and most important buildings are situated on or near it, between the Tivoli Wharf and the Customs Wharf. Facilities in the town include a hotel, a cinema, bakeries, a butchery and ice store, several large general stores, printing and plumbing establishments, and garage and minor engineering shops. There is also a reticulated high-pressure water-supply system. The land behind the town is mostly flat and marshy, with swamps to the west.

Pango Pango (Figs. 198, 199, 200)

Pango Pango, on the south coast of Tutuila, is a magnificent harbour protected from all winds by high hills which surround it. It is an L-shaped bay with the entrance arm about $\frac{3}{4}$ mile wide and $1\frac{1}{2}$ miles long. At the head of this stretch the harbour turns to the west and gradually narrows for a distance of about $1\frac{1}{2}$ miles. The shores are fringed with coral reef, but the reef edge is steep-to with deep water close up to it.

Developed primarily as a naval station it is also a port of call for vessels of the Oceanic Steam Ship Co. (Matson Line) on service between San Francisco, Auckland and Sydney, and all exports from eastern Samoa pass through Pango Pango (Plate 124).

Entry. On the western side of the entrance the reefs project about 300 ft. From these reefs to Breaker point on the east is a width of about 1,000 ft. Whale rock at a depth of about 2 fathoms, and Grampus rock at a depth of about 1½ fathoms, are in the fairway, but they are about 900 yd. apart and the channel between them has a depth of 25–30 fathoms. The inner harbour lying westwards of the entrance is about a mile long and has a depth varying from 6 to

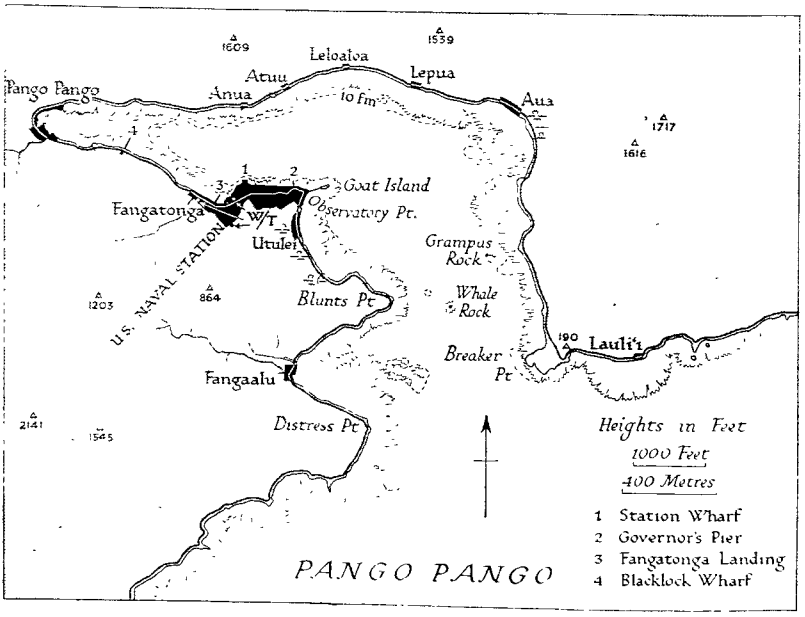


Fig. 198. Pango Pango harbour
Based on G.S.G.S. map no. 4300.

20 fathoms, but the western end is too narrow for large vessels to swing in.

Wharfage. At the Naval Station on the south side of the harbour is a wharf with a length of 300 ft. and 30 ft. of water alongside, but vessels up to 500 ft. in length can be accommodated. There are three landing stages: the Governor's Pier, east of the wharf; the Fangatonga Landing and the Blacklock Wharf. All these reach to the reef edge; the Fangatonga Landing, which is most used, has a depth alongside of about 6 ft. The depth of water at the Governor's Pier is 20 ft.



Fig. 199. Pango Pango harbour from the northern shore

A view from the vicinity of Lepua, showing the narrow strip of flat land round the harbour, the port in the neighbourhood of the W/T masts, Goat island to the left of these, and the peak of Matafao rising behind. Based on a photograph.

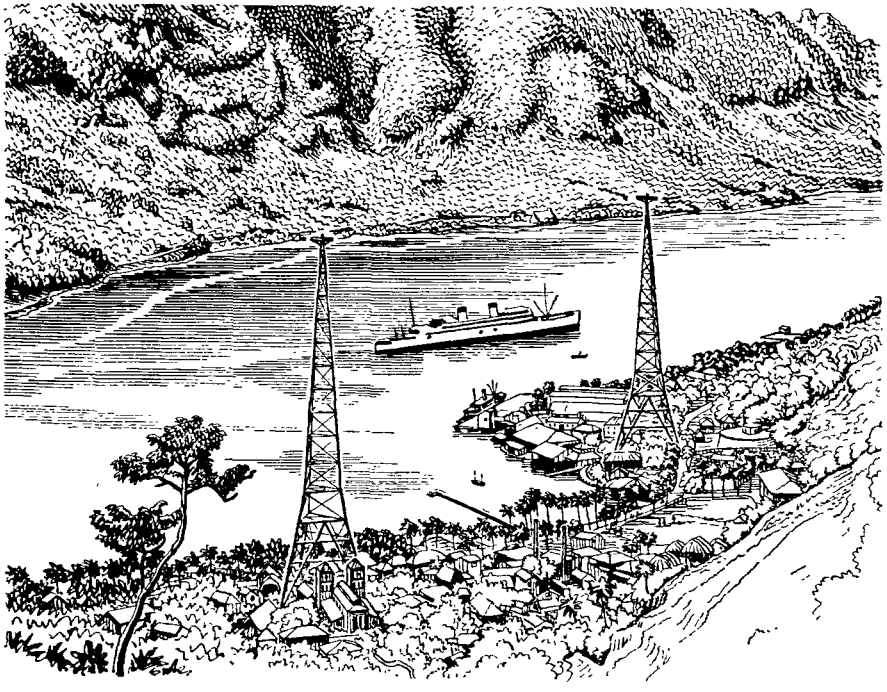


Fig. 200. The port of Pango Pango

A vessel lies at the Station Wharf and a Matson liner is anchored off it. Based on a photograph.

Supplies. Small quantities of coal are kept and two oil-storage tanks have been built. Provisions in considerable quantities are available but fresh meat is scarce. Water is piped to the wharf and also stored in a 25-ton floating tank.

Repair Facilities. The Naval Station has limited facilities for undertaking repair work.

Communications. There is a three-weekly service between San Francisco, Honolulu and Australian and New Zealand ports via Pango Pango; certain cargo vessels also call to load copra. Other communications are described on p. 673.

Town. There is no town in the normal sense of the word. On the south side of the harbour there is the Naval Station, which is the administrative centre of the territory. It is equipped with an electric lighting system, telephones, ice and cold-storage plant, a fresh-water supply system from a reservoir, a naval dispensary and a hospital for the treatment of Samoans of the territory. There are also general stores near by. Around the bay at intervals are Fangatonga, Pango Pango, Anua and other Samoan villages of varying size (Fig. 197), with a total population of about 3,750.

Recent Developments. Since the beginning of the war considerable developments have taken place which have made the above description obsolete in some respects.

SAVAI'I

Savai'i, lying roughly between lat. 13° 25′ and 13° 48′ S and long. 172° 07′ and 172° 47′ W, is the most westerly and the largest of the Samoan group. It is roughly rhomboid in shape with a length of about 48 miles and a greatest breadth of about 24 miles.

Structure (Fig. 179)

The island rises gently to a central dome-shaped massif with a maximum height at Maunga Silisili, an extinct crater, of 6,096 ft. A central ridge running from end to end forms a backbone on which are numerous old craters with parasitic cinder cones. Volcanic eruptions in historic times occurred in 1760, so far as accounts can be relied on; in 1902, when two new parasitic cones were formed to the north of Maunga Afi; and in 1905, when Matavanu, which is parasitic to mount Pule, erupted and remained active till 1911. The 1905 lava spread out in a northerly direction to the coast, a

distance of some 9 miles. Lava from Matavanu mostly took a north-easterly course, and on reaching the sea, spread fanwise along the reef which it enveloped completely. Since then volcanic activity in Savai'i has been dormant. The angle of the slope of most lava flows is about 6°, and round the coast are regions of flat or rolling country formed of disintegrated lava and occasionally interrupted by parasitic cones. The flattest, most fertile, and most populated area is in the extreme east of the island.

The thickly wooded interior, which is uninhabited and through which there are few tracks, is difficult of access and almost unknown. The German geologist Friedlander was able to cover only about four miles in a day's journey of eight hours.

Rivers

On the recent lava flows there are no surface streams. In the north and west such streams as exist are small. In the south and east, however, the river courses are wider and deeper and there is more water. The Alia Senga, flowing north-eastwards from a point south of Matavanu, carries water intermittently, but its lower course is a dry channel ending about a mile north of Patamea. South of Safune bay a stream passing over a fall travels underground to a fresh-water lake behind the bay. The Alia Matavai, flowing to the east coast, is a stream in which trout may be caught. The Sili river, running into the sea on the south coast, is very shallow and easily fordable; it reaches a width of about 200 yd.

Coasts

The south and south-west coasts from cape Paepaeoleia to cape Salia are lowlying but rocky. Large stretches are characteristically iron-bound, formed of old lava flows, and are precipitous and unsuitable for landing. There is no barrier reef, but fringing reefs stretch across two bays: Palauli bay, 6 miles from South-east cape, and Sala'ilua bay, about 20 miles from cape Salia. Native villages are scattered along the shore and joined by an indifferent track which follows the coast. The north coast, containing the areas covered by the more recent lava flows, is also rocky, with few opportunities for landing. Coral reefs stretch across the few bays. These are Asau harbour, 7 miles east of cape Puave, Safune bay, and Matautu harbour. For 13 miles eastward and south-eastward the coast is iron-bound. The east coast, about 8 miles north and south of cape Tuasivi, from Pu'apu'a village to Salelolonga, is low and sandy

but fronted by a barrier reef extending up to about 2 miles from the shore. Through this there are numerous passages, and depths inside the reef vary from 1 to 16 fathoms; mangroves occur in places.

Anchorages and Landings

There are no ports in Savai'i, but anchorages from which landings can be made are distributed round the coast. They are in Palauli bay, Satupaitea road and Sala'ilua bay on the south; Falealupo bay on the west; Asau bay, Safune bay, and Matautu harbour on the north; and Salelolonga on the east.

Palauli bay has a depth of 24 fathoms, with protection from north-east winds and landing is easy on a beach. The entrance is, however, almost entirely barred by the reef. Satupaitea road off the western side of Palauli bay is a space between the outer and inner reef with a depth of from 16 to 21 fathoms, but the outer reef provides no protection. Sala'ilua bay, 7 miles north-westward of the southernmost point of the island, is protected from winds north of east-south-east and has a depth of about 18 fathoms and good holding ground. A fringing reef fronts the sandy shore, where there is a settlement.

Falealupo bay, on the extreme western end of the island, is a shallow indentation, the northern half of which is filled with coral and rocks. In the southern half there is good protection from easterly winds in from 11 to 27 fathoms. The shore is sandy.

Asau harbour, about 8 miles from the west of the island, is obstructed by a reef and bar and can only be used by small vessels with a draft of less than 6 ft. Safune bay, an indentation in the coast with a fringing reef, has a depth of 13 fathoms and provides protection from south-east winds. Matautu harbour, 3 miles east of Safune, is protected by high cliffs and a reef. The depth is 11 fathoms. A small landing stage has been built in the bay, and there is a jetty at Fangamalo.

Salelolonga, on the east coast, with a depth of about 14 fathoms, is entered through the Su'ulu passage in the barrier reef or through the Avatele passage.

Communications (Fig. 201)

Small launches and schooners up to about 50 tons make periodic visits from Apia on Upolu to collect copra, etc., and native long-boats (*fautasi*) are used round the coast.

Road conditions are primitive. The only motor vehicle in Savai'i a few years before the war was one old car. Horses can be obtained

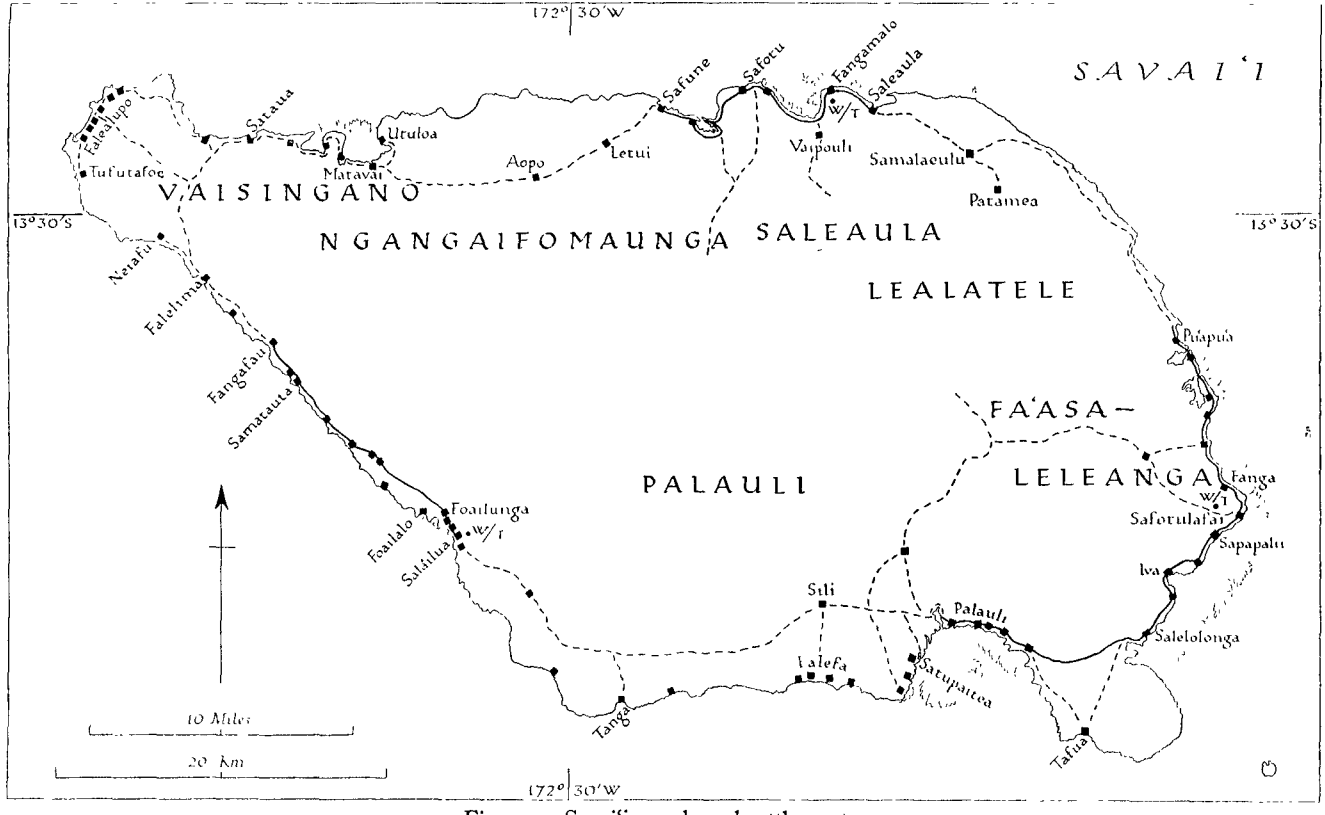


Fig. 201. Savai'i: roads and settlements

The names in large capitals are those of districts; Satupaitea, comprising an enclave in Palauli together with sub-districts in the west of the island, is not shown. Based mainly on: (1) U.S.H.O. chart no. 2921; (2) G.S.G.S. map. no. 4299; (3) Lands and Survey Department, Samoa, map no. 2; (4) map in *Appendix to the Journals of the House of Representatives of New Zealand*, A–4 (Wellington, 1936).

easily. Payment should be made for their hire, but to avoid offending native susceptibilities the transaction should not be treated on a business footing but on that of borrowing a horse, and making a gift of cash to the owner. From Pu'apu'a to Salelolonga there is a rough-made road over which a motor car can travel. A track circles the remainder of the island and there are a few tracks into the interior. From Salelolonga to Palauli the track is wide enough for a pony and trap but could easily be made wide enough for motor vehicles. Between Palauli and Sala'ilua it is only a rough walking track strewn with boulders. Between Sala'ilua and Sataua on the north coast the track is grass growing on disintegrating lava, but it is possible to drive a car through. To reach Falealupo from Sataua there are two tracks, but that round the coast is overgrown with bushes, and impracticable. The track along the north and north-east coast from Sataua to Pu'apu'a is over rough lava and is impracticable for vehicles. All river crossings are fords with the exception of a coconut-wood bridge some 200 ft. long at Pu'apu'a.

There are W/T stations at Fangamalo on the east of Matautu bay, at Safotulafai (Tuasivi) on the east coast, and at Sala'ilua on the south coast. These stations are only of low power and are used for transmission to Apia, whence messages to New Zealand are relayed.

Manono and Apolima

Manono and Apolima are two volcanic islets in the strait between Savai'i and Upolu (Plate 116).

Manono, about 2 miles from cape Fatuosofia, is within the barrier reef round the end of Upolu. There is no crater on the island, which is gently rounded and rises to a height of 197 ft. Slopes fall away steeply to the north-east but run out into a flat sandy plain to the south-west. There are no valleys or perennial streams but a few springs provide brackish water. A cistern of reinforced concrete has been provided by the administration for water storage. The island is well cultivated and thickly populated, and there is a dispensary.

Apolima, about $1\frac{1}{2}$ miles north-westward of Manono, is a circular island about $2\frac{1}{2}$ miles in diameter; it is formed of an ancient volcanic cone broken down to the north. The outer slopes of the ridge run down to the sea with a slope of about 60°, while those on the inside have an angle of between 30° and 40°. The floor of the crater is only about 18 ft. above sea level. In the extreme north is a small circular boat harbour entered by a narrow boat passage only suitable for

native long-boats (*fautasi*) or small launches. The island is formed of a thick brown tuff similar to that of Mt Tafua in Upolu. The impervious nature of this material prevents water sinking into the soil, and there is a stream running northward into the boat harbour.

UPOLU

Upolu, the most important island of the group, lies roughly between lat. 13° 47′ and 14° 02′ S. and long. 171° 22′ and 172° 02′ W. It has a length of about 47 miles and an average breadth of from 18 to 25 miles. The total area is about 600 sq. miles.

Structure (Fig. 178)

A mountain ridge topped by the cones of extinct volcanoes forms a backbone. The western end of the ridge is marked by Tafua, a well-formed flat-topped cone visible from the sea, with an altitude of 2,195 ft. The ridge rises to a height of 3,607 ft. at the cones of Fito and Va'aifetu, and then falls away eastward in a succession of peaks and cones of diminishing altitude. The high land is well wooded and steep, and rocky hills characteristic of deep erosion reach the eastern half of the north coast. Farther to the west and on the south coast the lower slopes form easy rolling country. Everywhere there is dense vegetation. The only flat areas are round Apia and in the Mulifanua district in the west. It is there that the principal plantations are situated. Surrounding the whole island, but interrupted by occasional rocky bluffs and headlands, is a narrow belt of coral sand upon which most of the native villages are built.

Rivers and Lakes

There are no rivers in the Mulifanua area, though there are numerous springs. Along the south side of the island where the rainfall is heavy, rivers are frequent, as they are also in the mountains on the north-east coast. Here numerous streams have cut deep channels into the softer rocks and terminate as waterfalls from hanging valleys. The largest stream in this area, the Falefa, after draining a flat plain ends in a waterfall behind Falefa bay. The rivers in the western and north-western area have waterfalls in their upper reaches but diminish in volume towards their outlets owing to percolation through cracks and hollows in the recent lava. In the centre

of the island, the crater of Lanuto'o is occupied by a deep lake with no surface outlet.

Coasts

Generally the coast may be divided into two types: the steep-sided coast characterized in particular by the north-east coast with its deep indentations which form convenient anchorages; and the flat sandy coasts fronted by barrier reefs extending seawards for a distance of 2 miles or so. Most of the shore is sandy with occasional bluffs or patches of lava making travel along the coast difficult.

In the extreme east of the island, where the shores are sandy and fringed with rows of palm trees, the reef extends about 2 miles, to surround the islets of Fanuatapu and Namua. From Samusu point to Saluafata harbour the coast is rocky and mountainous with numerous anchorages in deep bays or sunken valleys. Coral reefs of a fringing type occur across the heads of these, and just east of Saluafata the reef extends for about $1\frac{1}{2}$ miles. Saluafata harbour is a deep well-protected bay (see below). From Saluafata to Mulifanua the major part of the coast is flat and sandy with a barrier reef with numerous passages. The lagoon behind the reef increases in width to the westward, and offers facilities for seaplanes to land. Apia harbour (p. 655) in the middle of this coast is the principal harbour of the group though it is not so safe as Saluafata. Mangrove swamps occur on this coast but are not extensive west of Apia. At the extreme west of Upolu the reef extends westward to embrace the island of Manono and then follows the coast south-eastwards to the Mulitapu'ili peninsula. Along the rest of the south coast the reef is not extensive and there are few inlets or anchorages. The largest of these inlets is Safata bay, and the best anchorage is in Falealili harbour. Off the extreme south-eastern point, cape Tapanga, are two volcanic islets, Nu'utele and Nu'ulua.

Anchorages

The best anchorages in the north coast are in the deep bays to the east, where there is good protection from the prevailing south-east trade winds. Fangaloa bay is a deep funnel-shaped inlet on the north coast, surrounded by steep hills rising to 1,000 ft. and fringed by a narrow reef. There are boat passages through the reef to villages on the shore, and the depth in the anchorages is about 15 fathoms. Off the entrance to the bay is a bank with a depth of 8 fathoms, and there is shoal water off the village of Lona in the bay. Falefa harbour is a small

indentation in the coast about 3 miles west of Fangaloa, protected on the west by cliffs and with coral reefs on the east. It is a good anchorage for small vessels and has a depth of about 11 fathoms. Saluafata harbour, about $3\frac{1}{2}$ miles westward of Falefa, provides the best anchorage in Upolu. It is a roughly semicircular bay affording good anchorage in from 7 to 8 fathoms, and protected from heavy swells by a coral reef across the head of the bay. Through this reef there is a channel about 400 yd. wide. There are, however, shoals and banks in the harbour and a fringing reef along the shore. There are several villages round the bay. The largest of these, where there is the best landing, is Fusi. Occasional fowls and eggs and plenty of coconuts can be obtained from most of the villages lining the bay. Vailele bay is another small reef harbour divided by a reef with a minimum depth of $1\frac{1}{2}$ fathoms into two parts. It is open to the heavy swell and is not good.

Apia harbour has been already described.

Mulifanua harbour, near the west end of Upolu, is a very exposed anchorage. There is a small pier running out from the beach, which is wide and about 2 miles long but exposed to heavy surf.

Safata harbour, on the south coast of Upolu, is reported to be safe, but the entrance is narrow, through four reefs, and there is little swinging room. The harbour consists of two bays. The easternmost suffers from heavy surf, but the westerly one provides a good landing. Falealili harbour, 9 miles east of Safata, has depths of from 13 to 16 fathoms and is not greatly exposed to the ocean swell. But it is too small to allow sufficient cable to be veered in heavy weather.

Communications (Fig. 202)

Overseas communication is all concentrated at the port of Apia (p. 655). About fifty launches make coasting voyages round the island and to Savai'i.

In the immediate neighbourhood of Apia there are a number of well-made roads. Over the rest of Upolu roads are virtually confined to the coastal districts and communication in the interior is limited to trails and bridle paths. Altogether there are about 180 miles of roads suitable for motor traffic. A road of varying quality follows the whole of the north coast from Saluafata westwards and round the western end of the island to Si'ufanga. Along the south coast the route is either a track unsuitable for motor vehicles or a partly formed road. There are several tracks, suitable for foot traffic or pack animals, crossing the island from north to south. The most important of these

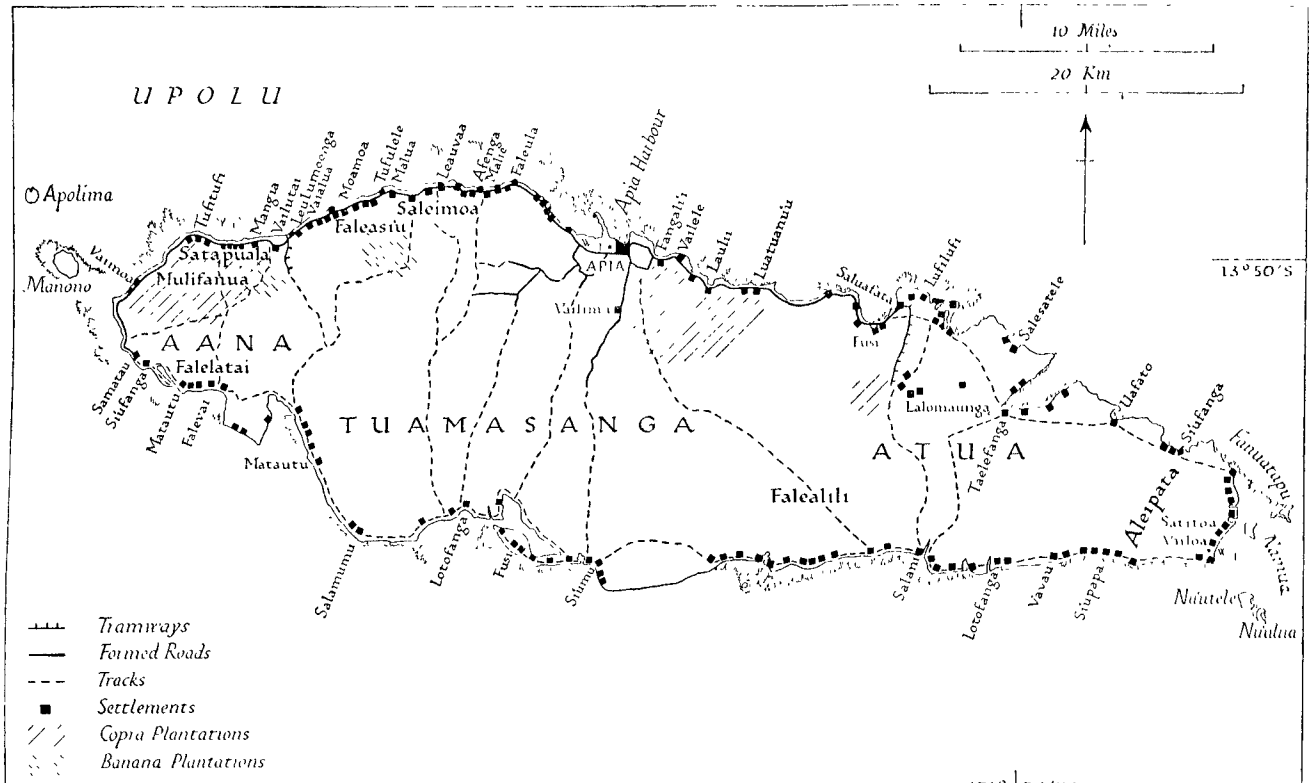


Fig. 202. Upolu: roads and settlements

The names in large capitals are those of districts; the more important sub-districts are also indicated. Plantation areas are greatly generalized, and approximate only. Based mainly on: (1) Lands and Survey Department, Samoa, map no. 1, (2) G.S.G.S. map no. 4209

connects Apia and Safata, the journey taking about 6 hours. A formed road running southward from Apia for about 5 miles continues as a track suitable for pack horses to Si'umu on the south.

The section of the road between Apia and Si'ufanga is a good double-track tarred road as far as Toloa on the north coast; beyond this point the road is rough, but is being improved. There are no bridges on this section owing to the smallness of the streams, but the fords are paved with concrete. Between Apia and Saluafata to the east, the road is mostly tarred, but the track is single in places and rather tortuous, though it is being improved. Bridges on this stretch are of reinforced concrete.

There are many motor vehicles, belonging chiefly to residents in Apia. In 1938 they comprised:

Private cars	97	
Taxis	28	
Government cars	6	
Motor cycles	5	
Private lorries	98	
Government lorries	16	
Motor-buses	22	(capacity 12–30 passengers)
Total	272	

A motor-bus service is operated between Apia and Toloa (and possibly on to Mulifanua) by the 'Gold Star' company; another company has running rights between Apia and Saluafata.

There are practically no carts, but horses can be easily obtained, and their quality has improved during the last decade.

Short lengths of tramway track were laid down a number of years ago, inland from Saluafata and Leulumoeanga, to transport copra from plantations to the coast for shipment. But it is probable that these have now fallen into disuse.

There were no airfields and no regular air services in 1938.

Signal communication with New Zealand is maintained by a high-powered W/T station at Apia which serves to relay messages from low-power outlying stations in Savai'i, from the Tokelau islands, and from Vailoa (a low-power station in the Aleipata district of eastern Upolu).

TUTUILA

Tutuila, the principal island of American Samoa, lies approximately between lat. 14° 14′ and 14° 23′ S, and long. 170° 33′ and 170° 51′ W. It has a length of 18½ miles, a greatest width of 7 miles and an area of approximately 54 sq. miles.

Structure (Fig. 203)

The island is nearly divided into two by Pango Pango harbour which, entering from the south coast, probably occupies a huge ancient crater the wall of which has been breached. Like the other large islands of the Samoan group, Tutuila has a backbone of volcanic mountains, but is considerably more eroded than the other islands. With the exception of a small area on the south-west it is rugged, with dense vegetation cleared only in places for native plantations. There are numerous small rivers, but many of them especially on the south coast sink into the porous soil before reaching the sea.

Coast

On the eastern half of the south coast a coral reef fringes the shore for the whole of its length. Beaches are rare, occurring mostly in the heads of bays. Elsewhere they are narrow, steep and rock-strewn. There is enough comparatively flat ground for villages to have grown up and for a road to have been built. About a mile offshore there is a line of banks with depths of 7–9 fathoms over them and deep water behind. West of Pango Pango the shore is fringed with coral as far as point Deceit, and again from Steps point to the extreme west of the island. The shore itself is formed of low rocks and blocks of lava projecting into the sea. East of point Deceit there is a shallow bay filled with coral, and east and west of Steps point are small bays with fringing coral reefs. Inland between point Deceit and Leone is the only flat part of Tutuila, which is the most fertile district of the island. The north coast is far more rugged and indented (Plate 115), and with steeper cliffs and little coral. Here there are several anchorages of moderate quality but there are few communications and villages.

Anchorages

Anchorage can be obtained apart from Pango Pango at a number of places on the north and south coasts. Those on the north coast are of little value since the only communication with the rest of the island is either by boat or native track. Hübner bay has anchorage in 17 fathoms, but is dangerous in north-westerly winds. Aoloau bay, with a stone pier, has anchorage in 15 fathoms, but is dangerous in northerly winds. Fangasa bay, where there is a small landing, has anchorage in 13 fathoms, and Vatia bay, protected by Cockscomb point and Cockscomb island, has anchorage in depths of from 4 to 21 fathoms. Afono bay, with good anchorage except in northerly winds, offers depths of 14 fathoms, while Masefau bay, with a small boat

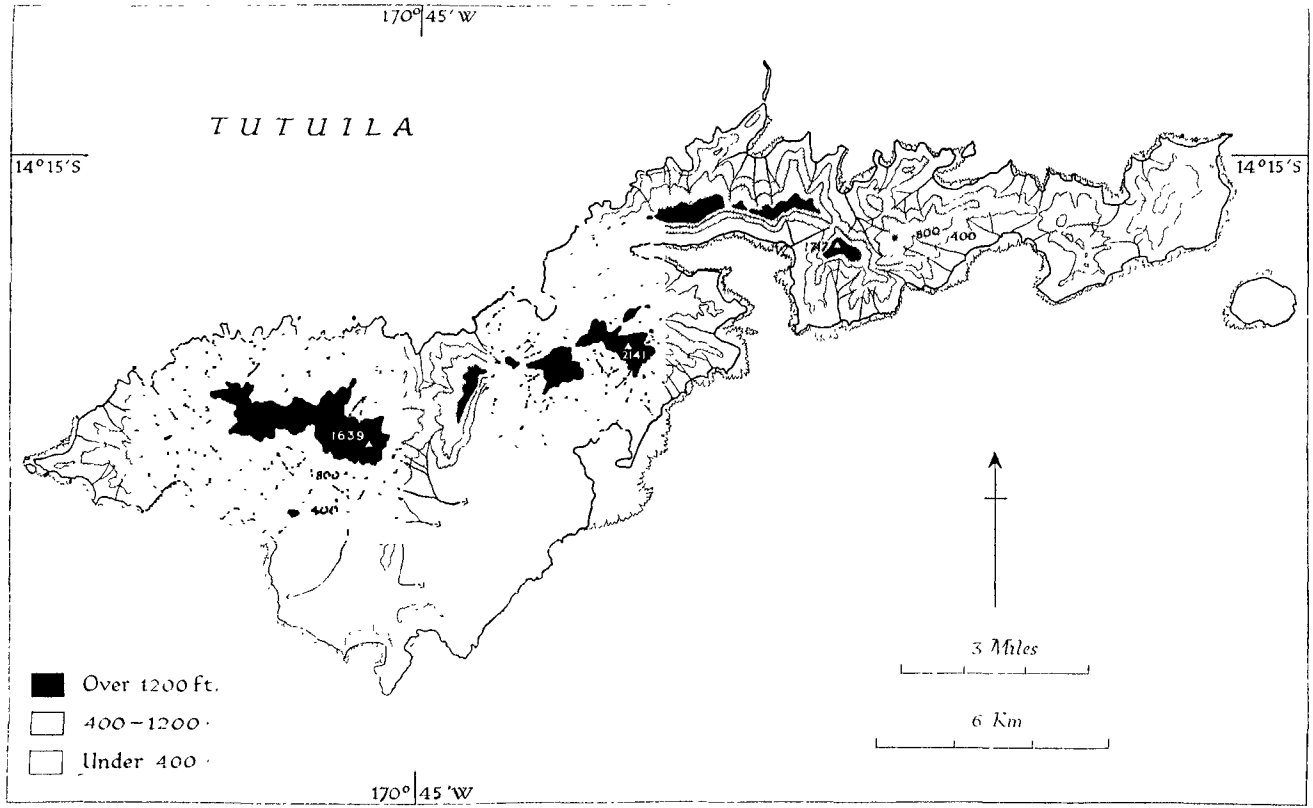


Fig. 203. Tutuila: physical

For place-names see Fig. 204. The streams on the south-west flow in the general direction indicated by the arrows, but most of the water in the lower courses goes underground. Based on G.S.G.S. map no. 4300.

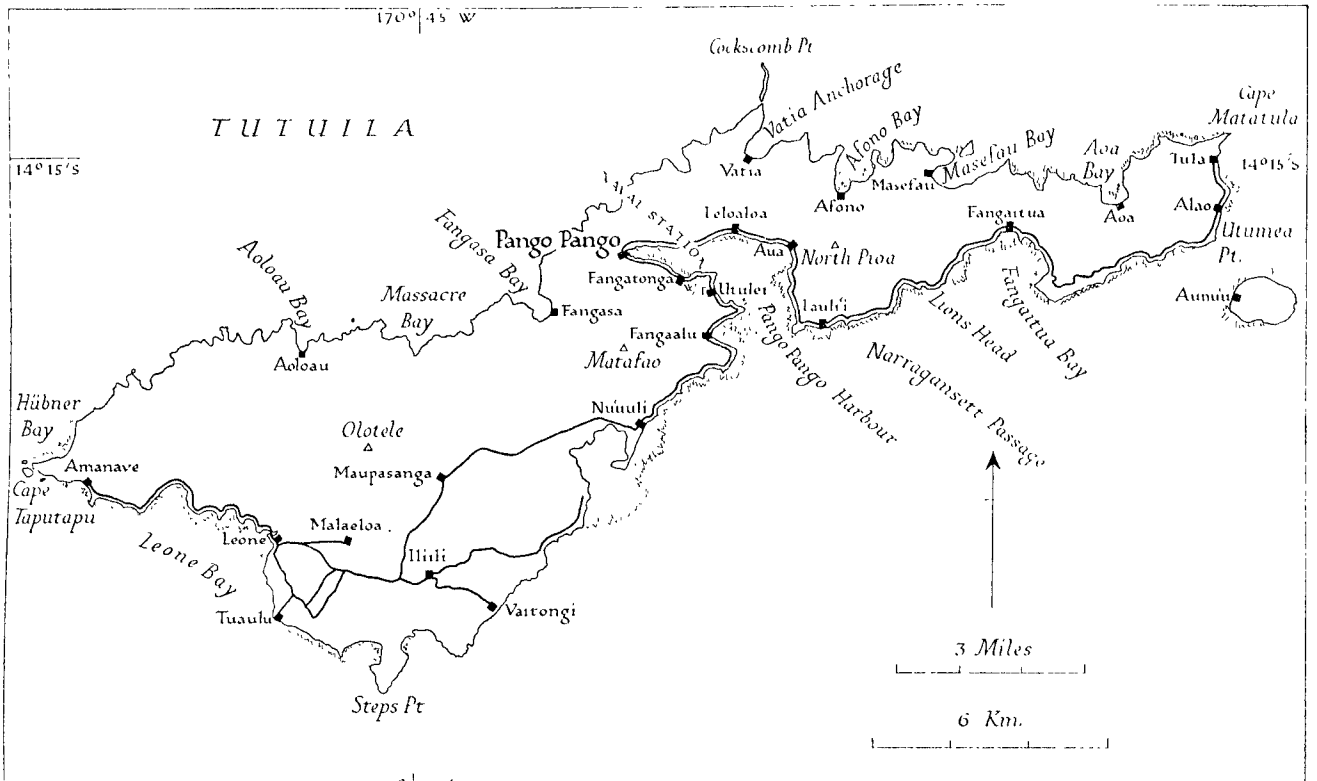


Fig. 204. Tutuila: roads and settlements

Based on G.S.G.S. map no. 4300.

channel to the shore, and Aoa bay, a little to the east of it, have anchorage in 17 fathoms.

On the south coast there is anchorage north-west of Aunu'u island in 35 fathoms. Fangaitua bay, exposed to south-east winds and fringed with coral reefs, has anchorage in 15 fathoms. Leone bay, which is safe in the trade wind season and when the wind is northerly, has anchorage in 16–20 fathoms; landing is available only at high water, through a passage in the reef, and rocks make it dangerous to boats when there is any swell.

Communications (Fig. 204)

Overseas communication is concentrated at Pango Pango (p. 657). A local steamer service runs between Pango Pango and Apia in Western Samoa. Native craft make coasting voyages.

Except for the one road skirting the south coast there are no roads capable of being used by vehicles. Tracks cross the main ridge through saddles formed by headward erosion of the streams, but some villages on the north coast have no land communication at all.

There is a large W/T station maintained at Pango Pango by the United States Navy.

AUNU'U

Aunu'u is a small volcanic islet one mile to the south of the eastern end of Tutuila. It is elliptical in shape, roughly 1,800 yd. long by 1,300 yd. wide, with a small volcanic cone 200 ft. high in the eastern point of the islet. The north-west area is flat and is used for the planting of coconut palms and pandanus. The village at the western end of the island is largely engaged in the manufacture of mats from pandanus leaves and such is the demand for them that coconut palms have been cut down to provide more space for pandanus. The coast is surrounded by a fringing reef.

MANU'A GROUP

(Fig. 205)

The Manu'a group, lying about 70 miles east of Tutuila, consists of the adjacent islands of Ofu and Olosenga, and of Ta'u. The total population in 1935 was about 2,300, and the people retain more of their primitive organization than do the inhabitants of any other parts of Samoa.

Ofu and Olosenga

Ofu and Olosenga are two volcanic islands roughly triangular in shape, and separated by a narrow strait 400 yd. wide. Both islands are surrounded by a fringing reef common to both, which dries out at low tide, and which obstructs the channel between them for anything except small boats. There are no harbours, but a fair anchorage with some protection can be found south of the islet of Nu'u, off the village of Ofu; the landing is difficult. There are villages at Ofu and Aloafao on the west coast of Ofu, and at Sili and Olosenga on the north-west and south-east coasts of Olosenga respectively.

Ofu is $2\frac{3}{4}$ miles long and about $1\frac{3}{4}$ miles wide, rising to a central ridge running east and west for a distance of about $\frac{3}{4}$ mile at a height

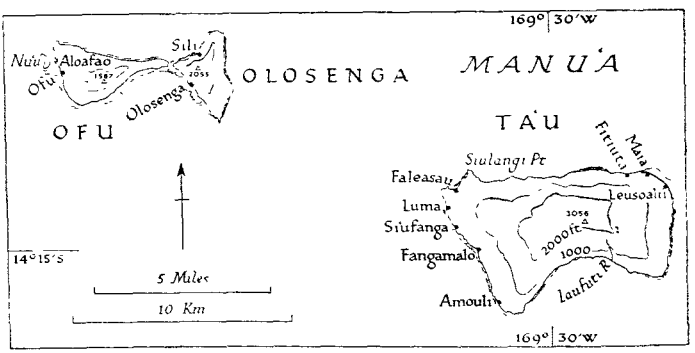


Fig. 205. Manu'a group

Based on G.S.G.S. map no. 4300.

of about 1,600 ft. The whole island is hilly and there is no level land except for a narrow strip on the west coast. The soil is a rich mould of decayed vegetation and decomposed lava. Vegetation fringing the beach consists principally of coconut palms, but there is a rich tropical forest on the ridge. There is a plentiful supply of water brought down by a pipe-line to the village of Ofu.

Olosenga, just east of Ofu, has a greatest north-south length of $2\frac{1}{4}$ miles and an east-west length of $1\frac{1}{4}$ miles. The island rises in pyramid form to a peak 2,095 ft. high, but there are two small level strips of ground on the north-west and south-west sides. Soil and vegetation are similar to those of Ofu. Water is led by a $\frac{1}{2}$ in. pipe to a concrete cistern in the village of Olosenga, and there is ample quantity.

TA'U

Ta'u lies about 7 miles east-south-east of Olosenga. It is roughly rectangular in shape, about $5\frac{1}{2}$ miles long and $3\frac{1}{2}$ miles wide. The highest point, 3,056 ft. above sea level, is in the middle of the island. From here the land slopes steeply and evenly to the sea. There are small stretches of level ground along the east and west coasts where villages are situated.

The soil is similar to that on the other islands of the group and the whole of the interior is covered by dense forest. Coconut palms are very abundant near the shore.

The island is surrounded by a fringing reef but there are many boat passages through it opposite the outflows of small streams. It is possible to anchor off the village of Luma and a landing can be made there. Landing on the east coast is dangerous and should only be effected when the south-east trade winds are not blowing.

The majority of the native villages are on the west side of the island, but three are on the north-east corner. They are at Fitiuta, Maia and Leusoali'i. A road runs between Maia and Leusoali'i and a short distance beyond each.

ROSE ATOLL

Lying about 80 miles south-eastwards of Ta'u, in lat. 14° 32′ S, long. 168° 11′ W, Rose atoll is the most easterly of the Samoa islands. It consists of a rhomboid ring of coral reef about 500 yd. wide, awash at low tide, enclosing a lagoon roughly $1\frac{1}{4}$ miles across with depths to about 8 fathoms. The entrance into the lagoon is a boat passage 9 ft. deep in its shallowest part and facing north-west. On the eastern side of the lagoon are two islets which appear to have changed their shape and size slightly from time to time. Sand island, which is devoid of vegetation and probably swept by storms, is at present roughly crescentic in form, about 200 yd. long by 50 yd. wide. Rose island, which rises to about 11 ft. above sea level, is roughly oval, measuring about 350 yd. by 200 yd.

The history of the atoll is comparatively uneventful. It was discovered by Freycinet in 1819 and named by him, though he did not land. Kotzebue and Dumont d'Urville passed within sight of it. The first recorded landing is that of Wilkes in 1839. The atoll was used occasionally by small trading vessels for fishing, and

the Godeffroy company tried to establish a fishing centre there, but the scheme proved unsuccessful and was abandoned. The various governors of American Samoa have arranged for annual visits to the atoll. In 1920 Dr Mayor, Director of the Department of Marine Biology of the Carnegie Institution, made a geological and botanical survey, and another survey was made in 1939.

The reef is a hard compact mass with blocks of limestone scattered about on it. Rose island itself consists of a layer of brown earth formed of decayed vegetable matter overlaying a mass of coral, shells, and lithothamnium which is reported to be rich in magnesium.

Covering a large part of the island is a dense grove of large smooth-barked *Pisonia* trees, with a few coconut palms planted by various visitors to the island. In addition to grass, the ground is covered with a low scrub of *Boerhaavia tetrandra*, a prostrate woody herb with several stems which reach a length of about a yard.

The only animal found is the Polynesian rat but a species of lizard is common. Sea birds are plentiful; they include sooty terns, boobies and bosun birds, which nest on Rose island. Frigate birds also visit the island but apparently do not nest. Small turtles are found in the lagoon.

There are no meteorological data from Rose atoll but some inferences can be drawn from the state of the *Pisonia* grove. There are unlikely to be hurricanes and there must be moderate rainfall. In 1939 there were no water supplies but it is reasonable to expect that small quantities could be obtained by catchment and stored in tanks.

BIBLIOGRAPHICAL NOTE

The best general account of Samoa is by Felix M. Keesing, *Modern Samoa* (London, 1934). Other general sources are the *Handbook of Western Samoa* (Wellington, 1925) issued by the New Zealand government; August Krämer, *Die Samoa-Inseln* (Stuttgart, 1903), an English translation of which, limited to 30 copies, has been issued by the Administrator of Western Samoa; A. Marquis, 'Notes pour servir à une Monographie des Iles Samoa', *Boletim da Sociedade de Geographia de Lisboa*, ser. 8 (Lisbon, 1898); and R. W. Robson (Editor), *Pacific Islands Year-Book* (Sydney, 1939).

Physical geography, including vulcanism, climate and flora, is covered by W. A. Setchell, 'American Samoa', *Papers of the Department of Marine Biology of the Carnegie Institute, Washington*, vol. XX, parts I, II, III (Washington, 1924); Reginald A. Daly, 'Geology of American Samoa', *Papers of the Department of Marine Biology of the Carnegie Institute, Washington*, vol. XIX, pp. 93–143 (Washington, 1924); Alfred G. Mayor, 'Rose Atoll, American Samoa', *Papers of the Department of Marine Biology of the Carnegie Institute, Washington*, vol. XIX, pp. 73–91 (Washington, 1924); J. A. Thomson, 'The Geology of Western Samoa', *New Zealand Journal*

of Science and Technology, vol. IV, pp. 49–66 (Wellington, 1921); H. I. Jensen, 'The Geology of Samoa and the Eruptions of Savai'i', *Proceedings of the Linnaean Society of New South Wales*, vol. XXX, pp. 641–672 (Sydney, 1906); Tempest Anderson, *Volcanic Studies* (London, 1917); Erling Christophersen, 'Flowering Plants of Samoa', *Bernice P. Bishop Museum Bulletin*, no. 128 (Honolulu, 1935); F. Reinecke, 'Die Flora der Samoa-Inseln', *Botanische Jahrbücher*, Bd. XXIII, pp. 237–368 (Leipzig, 1897); F. Vaupel, 'Die Vegetation der Samoa-Inseln', *Botanische Jahrbucher*, Bd. XLIV, Beiblatt 102, pp. 47–58 (Leipzig, 1910) and G. Angenheister, *A Summary of Meteorological Observations of the Samoa Observatory* (1890–1920), edited by E. Marsden and D. M. Y. Somerville (Wellington, 1924). This latter work is a particularly detailed analysis of meteorological data for the thirty years' period ending in 1920.

Useful historical works include: Robert Louis Stevenson, *A Footnote to History. Eight years of Trouble in Samoa* (London, 1892); Robert Mackenzie Watson, *History of Samoa* (Wellington, 1918); Foreign Office *Peace Handbooks*, vol. XXII, No. 146 (London, 1920); Newton Allan Rowe, *Samoa under the Sailing Gods* (London, 1930); Sylvia Masterman, *The Origins of International Rivalry in Samoa, 1845–84* (London, 1934) and George Herbert Ryden, *The Foreign Policy of the United States in relation to Samoa* (New Haven, 1933). The last two works are particularly valuable for the period ending with the partition of the group. The recent history of Western Samoa can be found in *Reports of the Government of New Zealand on the Administration of the Mandated Territory of Western Samoa* (Wellington, 1921–41). These reports form section A-4 of the *Appendix to the Journals of the House of Representatives of New Zealand*, and are the principal authority on administrative and political, as well as demographic, matters. American official sources for administrative problems are *American Samoa, a General Report of the Governor* (Washington, 1916 and 1927). These two publications are based on the *Annual Reports of the Governor to the Secretary of the Navy*, which are typewritten only. *The Annual Reports of the Secretary of the Navy* include short abstracts from the Governor's *Report*. The authority for economics and commerce is the *Trade, Commerce and Shipping of the Territory of Western Samoa* (Wellington, 1939). John Alvin Decker, *Labour Problems in the Pacific Mandates* (New York, 1940) provides useful information on the Chinese.

The two most useful works on the native people in addition to Keesing's *Modern Samoa* are Te Rangi Hiroa (Peter H. Buck). 'Samoan Material Culture', *Bernice P. Bishop Museum Bulletin*, no. 75 (Honolulu, 1930) and Margaret Mead, 'Social organization of Manua', *Bernice P. Bishop Museum Bulletin*, no. 76 (Honolulu, 1930). Other accounts include Margaret Mead, 'The Role of the Individual in Samoa Culture', *Journal of the Royal Anthropological Institute*, vol. LVIII, pp. 481–96 (London, 1928); Margaret Mead, *Coming of Age in Samoa* (London, 1929); Felix M. Keesing, 'The Taupo System of Samoa—A Study of Institutional Change', *Oceania*, vol. VIII, pp. 1–14 (Sydney, 1938): Aletta Mary Lewis, *They call them Savages* (London, 1938).

For maps see Appendix I.

Appendix I

MAPS AND CHARTS OF THE EASTERN PACIFIC

General

There are few detailed topographic maps of the islands in the Eastern Pacific. For the topography of islands as well as for coastal details reliance must be placed mostly on charts, or on sketch maps published in various journals.

Charts

Charts are all produced on Mercator's projection, and detailed charts of individual islands (as opposed to small-scale charts of groups) vary in scale from about 1:5,000 to about 1:600,000. The principal institutions producing charts of the Pacific are the Hydrographic Department of the Admiralty; the 'Service Hydrographique de la Marine', of France; and the United States Hydrographic Office. Some United States islands are charted by the United States Coast and Geodetic Survey.

Full details of British charts (including scale and date of publication) are given in the *Catalogue of Admiralty Charts and other Hydrographic Publications*; of French charts in the *Catalogue des Cartes, Plans et Ouvrages, qui composent l'Hydrographie Française*; and of American charts in the *General Catalog of Mariners' and Aviators' Charts and Books* published by the United States Hydrographic Office. Index sheets will also be found in the various *Sailing Directions*.

Charts of necessity cannot always be reliable or detailed in matters of topography. Hills are almost invariably shown by hachuring, rarely by contours. British charts are printed in black and white. For some time the United States departments have been producing coloured charts: land tinted yellow, sea tinted different shades of blue according to depth. Most French charts are produced in black and white, but for a few recent charts colour printing has been adopted.

U.S. Air Charts

The United States has produced a series of long-range air navigation charts on a scale of 5·2 in. to 250 miles. On the back of these charts are reproduced copies of U.S.H.O., or U.S.C. and G.S. charts of all islands contained within each sheet. Most of these reproduce a chart in the ordinary published version.

G.S.G.S. Maps

At present the only Eastern Pacific areas mapped by the Geographical Section of the General Staff are Samoa and Niue. The maps are copies of British and United States originals dating between 1903 and 1939.

Other Official Maps

The United States Geological Survey has produced a complete series of topographic maps of the Hawaiian islands on a scale of 1:62,500, and of the island of Oahu only on a scale of 1:20,000.

The New Zealand Lands and Survey Department has produced maps of the major islands under New Zealand control. Most of these are designed to show land holdings, but some other features are also shown.

The American Army Map Service has reproduced a few maps of Eastern Pacific islands. These are listed on index sheets issued at intervals.

Miscellaneous Maps

Many small-scale maps have been published in scientific and popular periodicals. These are usually on a small scale and are intended to illustrate particular phenomena. They are useful as providing data of various kinds, e.g. the spelling of native names, geology, population, etc.

Islands off the American Coast

For Guadalupe, both British and United States charts are based on a survey by U.S.S. *Gedney* in 1897, and corrected by a running survey by U.S.S. *Kanawha* in 1936. The U.S.H.O. chart is on a scale of 1:145,925, while the Admiralty chart has a scale of 1:600,000. An inset on the British chart shows the anchorage in Melpomene cove on a scale of 1:26,700 from a sketch by Lieut. E. H. Davenport, R.N., in 1892.

For Islas Revilla Gigedo, both British and American charts are based on a sketch survey in 1874 by U.S.S. *Narragansett*, except for Roca Partida which relies in part on a sketch survey of 1795 by Captain Colnett, R.N. For Clipperton, the original source for both British and American charts is a French survey of 1935 upon which the present French chart is based. The British chart has a scale of 1:50,000 and the American, 1:20,000.

The Admiralty chart of Cocos island is based on a sketch by Capt. Sir Edward Belcher, R.N., in 1838, with additions from the U.S. plan of 1898. Recent information suggests that the south coast differs considerably from the form in which it is depicted on both British and American charts.

Both British and American charts of Isla Malpelo are based on an American sketch survey of 1891.

Galápagos

The principal surveys of the group were made by Captain FitzRoy in H.M.S. *Beagle* in 1836. Other British surveys were by H.M.S. *Daphne*, 1846, and H.M.S. *Sappho*, 1886. A survey was made by U.S.S. *Yorktown* in 1909 and a 'reconnaissance' by U.S.S. *Marblehead* in 1925. A French vessel surveyed Black beach anchorage in 1887; and the Italian ship *Vettor Pisani* surveyed the north of San Cristóbal (Chatham island) in 1882–5.

The general chart of the group, in both British and American versions, is based on the *Beagle* survey, as also are most of the anchorages, with modifications from the surveys of H.M.SS. *Sappho* and *Daphne*. Cartago bay (Isabela) is not shown on British charts but is charted by the U.S. Hydrographic Office on a scale of 1:18,241 based on a survey of U.S.S. *Yorktown*. Darwin bay chart is dependent on the U.S.S. *Marblehead* reconnaissance of 1925. The British chart is on a scale of 1:70,000 and the United States chart on a scale of 1:40,000. The coast of Chatham island from Wreck bay to Stephens bay is based in both British and American charts on the Italian survey of 1882–5.

A one-sheet map of the group has been produced by the American Geographical Society, New York, on a scale of 1:1,000,000 on a polyconic projection, relief by contour lines and layer colouring. Political data are shown in fair detail. In general, this map conforms to the international 1:1,000,000 series.

San Felix and San Ambrosio

On the Admiralty chart the two islands are shown in an inset on a scale of 1:145,390 from a survey by H.M.S. *Leander* in 1900 with additions from the Chilean chart of 1874. Another inset shows San Felix road from the same sources, scale 1:18,170.

Juan Fernández

The Admiralty chart, based on a Chilean sketch of 1895 with corrections from the Chilean chart of 1921, shows Más-á-tierra on a scale of 1:103,970; Más-afuera, based entirely on the Chilean chart of 1921, is shown on a scale of 1:70,000. The chart of Cumberland bay is based on a French survey of 1870, but the topography is taken from an earlier British survey of 1830.

Oceanic Islands

Easter Island

Both British and United States charts are based on the Chilean chart of 1918, on a scale of 1:100,000, with larger scale insets for Cook (Hanga Roa) bay and Hutuiti anchorage. The American chart in addition shows La Pérouse bay. Sala y Gomez island is shown on both the above charts and from the same source. A map by L. J. Chubb shows approximate contours at 50 ft. intervals. A map by A. Métraux shows native names for parts of the island (see Bibliographical Note to Chapter II, p. 93).

Pitcairn and Adjacent Islands

Pitcairn is shown on a scale of 1:25,000. The Admiralty chart and the United States chart are based on a survey by Captain F. W. Beechey, R.N., H.M.S. *Blossom*, 1825. A sketch survey showing additional topographic details has been made by Alfred Pedersen of the yacht *Zaca* in 1934. Charts of Henderson and Oeno are based on Capt. Beechey's survey of 1826. Charts of Ducie and the coastlines of Henderson are derived from aerial surveys by H.M.S. *Leander* in 1937.

Society Islands

Both British and United States charts are largely based on French charts of the group, which are drawn from French surveys made mostly between 1842 and 1890. The French charts for the group include: Tahiti and Moorea, published in 1875, on a scale of 1:105,000; the island of Moorea on a larger scale from a survey of 1886 modified in part by a survey of 1931; Raiatea and Tahaa on a scale of 1:100,000; and Maupiti based on a survey by Duperrey in 1823. Large-scale charts include a plan of the port of Papeete from a survey of 1869, scale 1:6,000; several charts covering the coast of Tahiti based on surveys between 1840 and 1890, on scales varying from 1:14,000 to 1:25,000; large-scale plans of Raiatea and Tahaa (in three sheets, scale 1:25,000); Borabora (1:22,000); the entrance to Mopihaa lagoon; and Papetoai bay and Paopao (Cook) bay in Moorea. Papetoai was surveyed in 1931. All the last group show considerable topographical detail.

The series of British and American charts, with some exceptions, are on a smaller scale than the above. The island of Motu Iti is represented in different shape on the Admiralty chart of the western islands to that shown on the comparable American chart. In the former it is based on a French survey of 1823; in the latter on a sketch by Dr Martin L. Grant made in 1931.

A map of Tahiti on a scale of 1:10,000 was produced by the 'Service Géographique de l'Armée' in 1930.

Several sketch maps have been published by the Bernice P. Bishop Museum, Honolulu. They show geological features, ancient districts, etc.

Tuamotu Archipelago

British and United States charts borrow considerably from the French charts, based on French surveys or sketches ranging in date from 1845 to 1939, but do not show all islands and atolls of the group on a large scale. In many cases only passes

and anchorages are shown. Certain British charts are from other sources. Makatea is based on a sketch survey by P. E. Beverley in 1932; Hao on Captain Beechey's survey in 1825; Fangahina on a survey by Captain Wilkes of the United States Exploring Expedition in 1839. Atolls and islands shown completely on Admiralty charts are: Mururoa, Fangahina, Hao and Makatea. Anchorages and lagoon entrances only are shown for the atolls of Rangiroa, Ahe, Manihi, Takaroa and Apataki. A few United States charts, notably those for Fakarava, for the passes into the lagoon of Takaroa, and for Teputa pass and Avatoru pass in Rangiroa, are based on the same French surveys as used by the Admiralty. But the greater part, including those charts for the islands and atolls of Matahiva, Tikehau, Ahe, Manihi, Takaroa, Takapoto, Kauehi, Taiaro, Raraka, the Raevski group, Hereheretue, the Duke of Gloucester group, Tepoto, Napuka and Ravahere, Pukapuka and Reao, on scales of about 1:140,000, are all derived originally from surveys by Wilkes from 1839 to 1841, with very occasional minor corrections. French charts for the area are based on surveys and sketches from 1865 to 1938. The few exceptions are: the atolls of Ahe, Manihi and Takaroa, based on surveys by Wilkes; the entrances to the lagoons of Ahe, Manihi and Takaroa, based on Lachave's sketches of 1865; the two passes into Rangiroa on sketches of 1877; Fangahina, 1897; Tehanea pass, 1902; Raroia atoll and the passes of Amanu atoll, 1909; Mururoa, 1907; Niau, 1919. Fakarava was surveyed in 1937. Charts based on recent sketches are: Toau lagoon entrance, 1935; Makemo and Reao, 1935; Amanu, Vairaatea, Marutea, Pukapuka, Rekareka and Tikehau, 1937.

A number of sketch maps are given in scientific publications, e.g. by G. Friederici, K. P. Emory and G. P. Wilder (see Bibliographical Note to Chapter V, p. 226).

Mangareva group

The Admiralty chart covering the group is based on surveys by Beechey in 1826, D'Urville in 1838, and other French sources to 1895. The chart for Mangareva island itself is based on the French survey of 1894–5. French charts have a scale of 1:15,000 for the island of Mangareva and 1:5,000 for Port Rikitea. Both French and British charts show considerable topographic detail. Small sketch maps giving native place-names, etc., are given by Te Rangi Hiroa (Peter H. Buck) and K. P. Emory (see Bibliographical Note to Chapter VI, p. 259).

Austral Islands and Rapa

British, United States and French charts are all dependent on French surveys or sketches. The surveys are of Tubuai, 1896; Raivavae, 1899; Rapa, 1899; Rimatara, 1900. The sketches are of Rurutu, 1923, and Maria, 1938. Minor additions to the French charts of Tubuai have been given by Robert T. Aitken; and L. J. Chubb has given a map of Rurutu (see Bibliographical Note to Chapter VI, p. 259).

Marquesas

French, United States and British charts of the islands are, with the exception of Shaveh bay (based on a sketch survey by H.M.S. *Portland* in 1852), based on French surveys. Most of these French surveys were made between 1844 and 1882, and there are few charts showing whole islands. The Admiralty chart shows only Tahuata in full, but French charts show Nukuhiva, Hivaoa, Fatuhiva, Uapou and Uahuka; these give few details of topography away from the coast. In general French and American charts of the group are on a larger scale than Admiralty charts.

L. J. Chubb and A. M. Adamson have published a series of small scale sketch maps of individual islands of the group (see Bibliographical Note to Chapter VII, p. 298).

Hawaiian Islands and Johnston Island

These islands are the best mapped and best charted in the Eastern Pacific.

Charts. Being an integral part of the United States, the Hawaiian islands are charted by the U.S. Coast and Geodetic Survey (Department of Commerce) and not by the Hydrographic Office. British charts for the windward islands are nearly all based on recent U.S.C. and G.S. charts, but those of some anchorages and of some Leeward islands, notably Waianae, Makena bay and Nihoa island, are still based on surveys made by the Hawaiian government prior to annexation in 1898. The chart for Necker island is based on a British survey of 1894. In general, Admiralty charts are on a much smaller scale than the corresponding U.S.C. and G.S. charts. American charts are mainly based on surveys down to 1928 or 1932, with small corrections to 1941, but those of Midway islands are derived from a survey by U.S.S. *Iroquois* in 1900, with correction to 1939. The series comprises a general group chart, a larger scale chart of the windward islands, and one of the windward islands on a still larger scale of 1:250,000, in three sections. There are also charts, of Oahu, 1:80,000; south coast of Oahu, 1:20,000; and sections of the east coast of Hawaii, 1:10,000. Plans of ports and anchorages are on scales varying between 1:2,500 and 1:10,000. All the above are coloured and show considerable topographical detail.

The Admiralty chart of Johnston island, based on a survey by the officers of H.M.S. *Champion* in 1892, does not show the reefs completely. This chart and the corresponding U.S.H.O. chart are both obsolete in view of recent developments.

U.S. Geological Survey Topographic Maps. This series, on a scale of 1:62,500, has been published at various dates between 1910 and 1932, and is based on surveys in the years immediately prior to publication. The maps are on a polyconic projection with a Hawaiian datum and a 5,000 yd. grid based on the U.S. zone system but with a central meridian of 158° w. They show roads, railways, buildings and irrigation features. Contours are shown with brown lines at 50 ft. intervals. Keys to conventional symbols are printed on the backs of some sheets. The maps for the islands of Kauai, Molokai and Oahu are shown in specially large sheets, but the remainder are all on standard size, rectangular, 15 × 17 in.

A map of Oahu has been produced on 16 sheets, on a scale of 1:20,000, but no other details are available.

Public Roads Administration Map, 1939. A map produced to show progress on roads improved or constructed with grants from the Federal Aid Highway System is published by the Federal Works Agency. (Earlier editions, termed Road Progress Maps, were published by the Department of Agriculture, Bureau of Public Roads.) This shows the nature of the surface of the main roads but few other features. It is produced in two sheets on the following scales: Kauai and Oahu, 1:190,000; Molokai, 1:160,000; Lanai, 1:95,000; Maui, 1:26,000; Hawaii, 1:380,000.

Post Office Department Map, 1935. This is on a scale of 1:1,200,000 and shows railways, roads, cities and towns, post routes and post offices in operation. It also has insets of Guam and American Samoa.

Other Maps. A map published in *The Military Engineer*, vol. XXXIV, no. 196, p. 64 (Washington, Feb. 1942), shows the proposed improvements in Midway islands. There are also numerous geological and other maps published in the *Bernice P. Bishop Museum Bulletins* and other periodicals published in Hawaii (see Bibliographical Note to Chapters IX and X, pp. 411 and 451).

Central Equatorial Islands (Phoenix Islands and Line Islands)

Charts for most of these islands depend on sketch plans made by the phosphate companies which worked them; on British surveys made in the last part of the nineteenth century in connexion with the trans-Pacific cable; and on recent United

States surveys inspired by the potential value of some of these islands as air bases. The latest survey, by U.S.S. *Bushnell* in 1939, covers all important islands in the area, but has not been published. In almost every case British and United States charts rely on the same sources, viz. Enderbury on a sketch survey, and Hull, Birnie and McKean on surveys by the United States Exploring Expedition in 1840 (although an unpublished survey of Gardner was made in 1936); Flint on a German sketch survey of 1878; Malden on a sketch survey by H.M.S. *Gannet* in 1881; Caroline and Vostok on surveys by J. T. Arundel in 1883; Starbuck on a sketch by Messrs Houlder Bros. and Co.; Phoenix, Sydney and Canton on surveys by H.M.S *Egeria* in 1889; Fanning and Palmyra on a survey by H.M.S. *Penguin* in 1897 (the American chart for Palmyra is from a survey by U.S.S. *Portsmouth* in 1874); Christmas on a survey by Père Emmanuel Rougier in 1924.

The Admiralty chart of Gardner island is based on a survey by H.M.S. *Wellington* in 1936. Both Admiralty and U.S.H.O. charts for Jarvis, Howland and Baker are from surveys by U.S.S. *Itasca* in 1936. There are a few other maps of some of these islands. The New Zealand Public Works Department compiled a map of Fanning island on a scale of 1:9,600, in 5 sheets. This map was based on information collected by the New Zealand Pacific Aviation Survey Expedition in 1939. A sketch survey was also made of McKean in 1937 by a government expedition to investigate the suitability of the island for native settlement. The New Zealand Public Works Department carried out a survey of Gardner island in 1939.

An archaeological survey of Malden island was made by the *Whippoorwill* Expedition, and a map incorporating the results was published by K. P. Emory (see Bibliographical Note to Chapter XI, p. 503).

Tokelau Group

Admiralty charts for Atafu and Nukunono are based on surveys by H.M.S. *Goldfinch* in 1896; and those for Fakaofu and Swains island on surveys by H.M.S. *Egeria* in 1889. A survey of these islands was also made by U.S.S. *Bushnell* in 1939.

Northern Cook Group

British and United States charts for these islands have common sources. The chart of Tongareva is based on a New Zealand Lands and Survey map of 1932, with additions from surveys between 1881 and 1920, the latter by H.M.S. *Veronica*; that of Manihiki on a New Zealand Lands and Survey map of 1932, with additions from a sketch map of 1899; that of Rakahanga on the New Zealand government survey of 1906. The chart of Pukapuka is based on a sketch by R. D. Frisbie in 1926; that of Nassau on a sketch by H.M.S. *Alert* in 1899; and that of Suvorov on a survey by H.M.S. *Pylades* in 1900, with additions from sketch surveys by H.M.S. *Veronica* in 1920.

Other maps include a sketch map of Manihiki by Te Rangi Hiroa (Peter H. Buck) based on a sketch by the Government Surveyor of the Cook islands; and another by the same author based on an incomplete survey of Rakahanga; both these maps are useful in giving correct spelling of place-names (see Bibliographical Note to Chapter XII, p. 581).

Lower Cook Group

All United States charts of these islands are derived from Admiralty charts. The Admiralty charts for Rarotonga is based on the New Zealand Lands and Survey Department map of 1913 (1:16,000) and a survey by H.M.S. *Veronica* in 1922; Avarua and Avatiu harbours on a survey by H.M.S. *Veronica* in 1922; Mangaia on a survey by P. Marshall in 1924; Mauke, Takutea and the Hervey islands on New Zealand Lands and Survey Department plans of 1906; Atiu on a plan by the same department of 1919; Aitutaki on a survey by H.M.S. *Champion* in 1892.

Niue

The Admiralty chart shows Niue on a scale of 1:125,000, based on a survey by H.D.M. Haszard in 1903. The U.S.H.O. chart is derived from the same source. A G.S.G.S. map is from the same source, but on a scale of about an inch to a mile. E. M. Loeb has published a folding map of the island giving correct Polynesian spellings for 385 place names (see Bibliographical Note to Chapter XII, p. 581).

Samoa

In Western Samoa the basic sources of both Admiralty and U.S.H.O. charts are German naval surveys of various dates ending with the survey of S.M.S. *Kondor* in 1912. For American Samoa, American surveys between 1901 and 1930 are the principal sources.

British charts of the north coast of Upolu, Apia harbour, and most of the anchorages on Upolu and Savai'i are from the German survey of 1912. Those of Tutuila island and Pango Pango harbour are based on American charts to 1929. But the chart of Saluafata harbour is based on a survey by H.M.S. *Laburnum* in 1928; that of Faleasau bay from a sketch by J. B. Haines in 1866; that of Sili road from a sketch by the officers of the mission ship *John Williams* in 1909. American charts of Tutuila, Pango Pango, and the Manu'a group are from recent American surveys; of Upolu and Savai'i and various anchorages from the German survey of 1912.

The U.S. chart of Apolima is based on a survey by the United States Exploring Expedition in 1839, as also is that of Uafato bay. German charts are mostly from German surveys to 1912, but those of Tutuila and the Manu'a group, Apolima and Matautu are from American charts. Scales for anchorages on Admiralty charts and U.S.H.O. charts vary from 1:7,520 to 1:50,000. A more detailed rendering of topography is given on the German charts than on any others.

Other official maps include: two Lands and Survey Department maps, of 1921 and 1922, showing government, European and native lands in Upolu and Savai'i, on a scale of 1:100,000. Roads are shown on these maps but they are not up-to-date. Two maps were published annually with the *Appendix to the Journals of the House of Representatives of New Zealand* until 1936, showing medical stations, roads and water supplies. Three maps of Samoa have been reproduced by G.S.G.S. in 1942. Those for Savai'i and Upolu are based on the Lands and Survey Department maps mentioned above, and that for Tutuila and the Manu'a group on the American chart.

Appendix II

PLACE-NAMES IN THE EASTERN PACIFIC

Treatment of place-names in the Eastern Pacific is complicated by several factors. A number of sovereign states are concerned in the administration of the area. Historically, names have been assigned to places in several languages—principally in one or more of the group of closely related Polynesian dialects, and in Spanish, English, or French. Though Roman characters have been used in all cases in writing the names, the system of orthography has not been uniform; in other words, the same letters have not always been used to represent the same sounds. Finally, the spelling of place-names has been somewhat haphazard, even in official publications, so that the written form of the same name may vary, or may not correspond to the local pronunciation of it.

A summary of the main principles adopted in this handbook for place-names has been given in Chapter I (p. 7), but it is desirable to give a fuller analysis of the position here.

General Situation: 'National' and 'Official' Names

For the Oceanic islands near the American continent the place names are solely of European origin. Here the problem of regularizing usage has been partly one of the relation between local names and official names, and partly one of the degree to which the names in various European languages and their associated geographical terms have been assimilated to the language of the country concerned in publication or in administration. The problem has arisen particularly in the Galápagos.

Many of the islands here were originally given Spanish names by their discoverers, but English names were later applied to them and to anchorages when more vessels called. The various Latin-American governments exercising sovereignty over the islands have naturally given official recognition to Spanish forms, though some of these are merely translations of the English names. But in 1892 the government of Ecuador renamed the Galápagos in honour of Columbus, calling the group Archipiélago de Colón, and applied to the individual islands names which he had given to the West Indian islands when he discovered them, but which had been allowed to fall out of use. All these official names were adopted by the inhabitants with the exception of the name of the group itself, which they still continued to call Galápagos, and of Santa Maria, which they continued to call Floreana. They also retained their own conventional names for localities, such as Puerto Chico, officially named Puerto Baquerizo Moreno. Some localities, however, mostly bays not used by the inhabitants, continued to bear officially an English name with a Spanish geographical term added. A list of the alternative names given to the Galápagos group and its islands at various times appears in the Foreign Office *Peace Handbooks*, vol. XXII, no. 140, p. 25 (London, 1920).

For the Spanish-American islands of the Eastern Pacific British official usage has not yet reached complete uniformity. For instance, Admiralty charts use English names alone on charts of Guadelupe and the other northern islands; English names, with official names of the islands in brackets, on charts of the Galápagos; and official names on charts of Juan Fernández (except for Cumberland bay). The *Sailing Directions* now use the official names throughout, for all islands and localities, but usually give any local name or English name if there is one.

The majority of place-names in the Eastern Pacific, with the exception of those in the outlying Oceanic islands near the American continent, are Polynesian in origin. The Polynesians were intrepid voyagers in their canoes, and even before the advent

of Europeans in the area they had given names to practically all the islands, even the uninhabited ones, as well as to a multitude of natural features. Many of these names still current to-day refer to incidents in the mythology, traditions or history of the people. With the coming of Europeans, names were applied by them to islands, prominent natural features, and some settlements. And owing to the diverse nationality of the early explorers, many islands had more than one name given to them. Thus the atoll in the Tuamotu archipelago known to the Polynesians as Hao was called Ile la Harpe by Bougainville, who discovered it in 1768, and Bow island by Cook, who visited it a year later. For many years these were the respective French and British official names in use. More recently, however, it has become the practice to retain native Polynesian names if they are known. The more important place-names in the Polynesian area have been published for British official use by the Permanent Committee on Geographical Names, in the *First General List of Oceanic Names*, and *Third General List of Oceanic Names* (London, 1922 and 1924; revised 1935). But the use of Polynesian names presents special problems not only of orthography and spelling, but also of the employment of geographical terms in conjunction with them. These problems are discussed below.

Exceptions to this use of native names are in the case of a few small islands, mainly those not regularly inhabited by Polynesians, and some notable physical features such as Le Diadème peak in Tahiti, Diamond head in Oahu, or Mt Duff in Mangareva. (Group names such as the Cook islands do not fall in this category, since there was no Polynesian name for these islands as a whole.)

This policy of using Polynesian names has been followed by all the governments concerned in the area. On maps and charts and in official publications the older European names have been largely discarded (or cited in parentheses for historical reference). There is a great degree of uniformity in regard to the proper names used. But a few exceptions are found, mostly with island groups for which there was formerly no comprehensive Polynesian name; the practice has been in some cases to apply to the group the name of one of its largest islands, and in others to use a European name for it. Thus Admiralty charts and *Sailing Directions* use the form Mangareva islands for what French official publications refer to as Iles Gambier, and use Austral islands or Tubuai group for the French Iles Tubuai. (The United States Hydrographic Office *Sailing Directions* refer to Tubuai or Austral islands, and to Mangareva (Gambier) islands.) Other differences occur through the translation of proper names. Iles de la Société (itself a translation of a name applied by Cook) becomes in British and American publications Society islands; Iles du Vent becomes Windward group; and Isla de Pascua, Ile de Pâques, Easter island, are the respective Chilean, French and English forms of the name of the island originally named Paasch Eylandt by Roggeveen. Finally, national practice has been to render in the language of the country concerned that part of a name which is a descriptive geographical term.

In this volume of the handbook official names have been used, with a few exceptions. Accepted local names have been used for place-names in the Galápagos, though the official names are also given. For Polynesian names the lists published by the P.C.G.N. have been followed, apart from a few variations in spelling. Certain conventional names of island groups and major islands have also been used in the form given in the P.C.G.N. lists—these are widely current in English-speaking countries. The principal conventional names so employed are: Marquesas, Society islands, Austral islands, Mangareva islands, and Easter island (given by the P.C.G.N. list as an alternative form to Rapa Nui). A few historical place-names such as Traitors bay and Virgins bay (in the Marquesas) have also been retained in English, instead of being used in their official French form.

Geographical Terms in Polynesia

While there is a great degree of uniformity in regard to the general use of Polynesian proper names, divergence is shown in regard to the forms of descriptive

geographical terms used in combination with them. National practice has been to render the latter in the language of the country of publication, not in that of the country administering the territory, or (normally) in the native language. Thus to the French Presqu'ile de Taiarapu, Baie de Matavai, Passe de Maraa correspond the English Taiarapu peninsula, Matavai bay, Maraa pass, etc. This procedure is not always consistent; for Easter island the Admiralty *Sailing Directions* use English geographical terms, but the chart uses English terms for some features and Spanish for others, e.g. Cook Point, Punta Roa, Pta San Juan.

A further complication arises from the fact that many Polynesian names in their accepted form include a native geographical term. For instance, in the many names beginning with *Maunga* and *Ava* these components mean 'mountain' and 'channel' (or 'pass') respectively. If such names are followed by European geographical terms the result is pleonasm—Mt Maungaroa literally means 'Mt Long Mountain'; Avaiti Pass means 'Little Channel Pass', etc. To secure a European geographical term and at the same time preserve the logic of the name, this could be translated in full—Long Mountain, Little Pass. But this would reverse the principle of retaining the Polynesian name, and would be unsatisfactory in other ways. Full translation is possible with simple descriptive names such as those cited above, but is often impossible with names of obscure etymology or of alternative meaning; many such names have been applied as the outcome of historical events, and their significance cannot be extracted unless the precise context of circumstances is known. On the other hand, if the native name with its geographical compound is used alone, without a European term added, certain difficulties arise. Some knowledge of the meaning of Polynesian geographical terms is required from the reader. Moreover, many native place-names are not compounded with geographical terms, which are either understood or added in running description when needed (as English rivers are commonly referred to as 'the Thames', 'the Severn', etc.). If native names alone are used the alternatives are to use forms such as Maungaroa and Ohiri, Avaiti and Tapueraha, without specifying what kind of natural feature the latter is in each case; or to create forms such as Maunga Ohiri and Ava Tapueraha, which may well be artificial, and not in actual native usage. If, however, a geographical term is required with each place-name, the choice lies between frequent pleonasm and a mixed presentation of native and European terms.

Official policies have not been consistent on these points. Some Polynesian geographical components of place-names have been allowed to stand alone, without European addition. This is so particularly with *Motu*, island, though some French charts give forms such as Rocher Motu iti, literally 'Little Island Rock'. In the Marquesas, French charts usually use *Hana* and *Haka*, both meaning bay, without an added geographical term, but the Admiralty charts and *Sailing Directions* sometimes append 'bay' on these names and sometimes not. Other reduplicated forms on charts are Faaroa *Bay*, Te Avamoa *Pass*, *Mt* Maunga Roa. But a difficulty in the avoidance of pleonastic constructions is that by process of transfer a name originally applying to one type of geographical feature has come to be applied to others; thus a name beginning with *Vai* and referring to a stream may be used to refer also to a valley or a bay associated with the stream; a name beginning with *Hana* and referring to a bay may be applied also to the settlement on the bay. Considering that knowledge of the Polynesian language is not widespread, clarity may be preferable to strict logic in cartography and geographical description of these areas. In this handbook British and American official practice has been followed, but to some extent systematized. For the Polynesian islands geographical terms are given in English, except for names beginning with *Motu*, *Maunga*, *Hana* and *Haka*, where pleonastic constructions have been avoided. For clarity, on all maps the term 'pass' is used where relevant, even when the native place-names begin with *Ava*. To assist in distinguishing settlements from physical features bearing the same name, the former are given in roman lettering, the latter in italic lettering.

Orthography of Polynesian Names

For historical reasons the writing of Polynesian words, including place-names, has not yet been standardized. The Polynesians themselves had no method of writing before the coming of Europeans, and the attempts of the early explorers to render their place-names often gave rise to curious forms. Those assimilated to English spelling were among the most peculiar, such as Owhyhee (Hawaii), Tiarrabu (Taiarapu), or Feto Hougo (Fatuuku). But the various Polynesian dialects were soon given written form, mainly through the efforts of missionaries. These men produced alphabets which on the whole did provide fairly satisfactory working rules for reproducing the language, and which in most islands are still the basis of education. But with modern phonetic training not available to them they did not adopt fully scientific methods for reproducing the native sounds, nor did they always hear these sounds correctly. The result has been in a number of cases a failure to represent to a reader the sound of place-names as they are actually spoken, and a lack of uniformity between the methods of writing such names in different island groups.

One of the most obvious examples is in the reproduction of the sound *ng* (pronounced as in the English word *singer*). This sound, though absent from Tahitian and Hawaiian, occurs in almost every other Polynesian dialect. In the Cook islands, as in New Zealand, it is represented in writing by the two letters *ng*; but in Samoa, Niue, Tonga and (usually) in the Tuamotu archipelago, it is represented by the letter *g*. Locally, where the phonetic value of the symbol is well understood, this presents no difficulty. But a visitor is often misled; he is apt to pronounce the name Pago Pago, for instance, as Paygo Paygo or Paggo Paggo, instead of Pango Pango, the correct form (it must also be borne in mind that the *a* is more open and the *o* more rounded than in English; both are pure vowels, not diphthongs). The P.C.G.N. lists and the Admiralty *Sailing Directions* use *ng* (not *g*) in such words; the United States Hydrographic Office *Sailing Directions* generally use *g* but occasionally add the form with *ng* in brackets. Another example of orthographic weakness has been the omission of certain letters from some dialects. The *h*, for instance, does not occur in the written form of the Manihiki-Rakahanga dialect, because the alphabet was introduced from Rarotonga, where that sound does not exist. The result is that the people pronounce the name of their atoll Manihiki but write it Maniiki.

A more complex problem is that concerned with the use of the glottal stop (glottal closure), a break or catch in the voice, which results in a plosive consonant. This sound is often heard in some English districts, as when a word such as *butter* is pronounced *bu''er*, etc.) The glottal closure is absent from some Polynesian dialects, including Maori and Tuamotuan; where it occurs it would seem etymologically to have replaced a *k* sound in some cases, an *ng* in others. It is a significant sound, equivalent to a consonant, and the omission of it from a word may change the meaning of what is being said. But treatment of it has not been consistent in Polynesian literature, or on maps. In some dialects, as Samoan and Tongan, it has been represented fairly systematically by a recognized phonetic symbol, ' (inverted comma). Both the local governments and the mission bodies follow this usage on maps and in publications; in the lists published by the P.C.G.N., however, in Admiralty *Sailing Directions*, and on Admiralty charts, the symbol is omitted, though the P.C.G.N. lists note it for pronunciation. The G.S.G.S. maps of Samoa also omit the symbol in most cases.

In the Tahitian dialect the symbol was omitted altogether by the early missionaries and is still rarely used, even by natives in correspondence. Here as elsewhere in Polynesia the situation has been complicated by the practice in which some writers have indulged, of using the comma in one form or another to indicate the simple elision of a vowel (as *roa'tu*, a shortened form of *roa atu*), or, less fortunately to mark the position of a consonant dropped (or thought to have been dropped) from an earlier form of the language. The latter offers much field for speculation,

and it is not surprising to find that two writers will place a glottal stop in different positions in the same word. In other dialects again, the recognition of the glottal closure is still confused, as in Mangarevan, where it was thought by the French missionaries to be an aspirated sound and was represented by an *h*. In some dialects, as in those of the Northern Cook group and of the Marquesas, the exact quality of the sound has still to be determined.

The orthographical principles followed in this handbook are in general those of the R.G.S. II system adopted by the P.C.G.N. in their lists of Oceanic names. In particular, *ng* has been used throughout for the sound as in *singer* (represented phonetically by ŋ), and the symbol *g* used for it officially in some dialects has been discarded. On the other hand the symbol ['] has been used for the glottal closure in Samoan place-names. Though this departs from P.C.G.N. practice, and from that of Admiralty charts and *Sailing Directions*, it is in accord with modern scientific usage, as exemplified by the recent publications of the Bernice P. Bishop Museum, as well as with the official practice in the group. For other areas, such as Tahiti, Mangareva, the Marquesas or some of the Northern Cook islands, where the glottal stop is not in systematic use in the literature or on maps, and where indeed its existence in a place-name cannot always be precisely determined, the symbol has been omitted from place-names in this volume, though it has been included in a few ordinary native words in the text. Finally, it must be noted that the present orthography of the Polynesian place-names, and of the language as a whole, is only approximate. When systematically treated, as discussed above, it gives a fairly close rendering of the sounds, but leaves their precise quality still undetermined. For instance, *t* and *r*, though accurate enough renderings for ordinary use when pronounced in the English way, do not reproduce the sounds exactly as they are pronounced by Polynesians.

Spelling of Polynesian Names

European maps, charts, *Sailing Directions*, etc. show some diversity in the spelling of Polynesian names, even when the orthography is the same. The reasons for this lie largely in the structure of the Polynesian language itself. Many Polynesian words, including place-names, are compounds of other simpler words. The writing of a name as a single word or in its component parts becomes then largely a matter of convention, since it is frequently not possible to decide how far the meanings of the different parts of the name are separable or have become fused in a single idea. The difficulty here is increased by the fact that in very many cases one simple word, written and pronounced in exactly the same way, has a number of different meanings, and the context alone decides which is correct. Moreover, the Polynesian adjective follows its noun, and with some very common expressions the linkage is so close that they may be considered as almost forming one word. (Examples are Motuiti, Motutapu, Maungatea; 'Little Island', 'Sacred Island', 'Long Mountain' respectively; these common place-names may have lost their original meaning. Analogies in English are Holywell, Sevenoaks, Cambridge.)

The policy adopted in official publications has not been entirely consistent. The French *Instructions Nautiques* give, for instance, forms such as the following for passes in the Society islands: Ava-Iti, Ava Roa (Moorea); Ava Iti, Ava Ino (Tahiti); Avamoa, Avapeihi (Huahine); Teavarua, Teavamoa (Raiatea). The Admiralty *Sailing Directions* give Avaiti, Avaroa; Ava-iti, Ava-ino; Avamoa, Avapeihi; Teavarua, Teava Moa; for these names. The U.S.H.O. *Sailing Directions* give all in the form Avaiti, Avaroa, etc. The charts show similar discrepancies. But in all cases the forms are analogous; *ava*, 'pass', is the substantive; the syllables following it are adjectival, meaning 'long', 'small', etc. *Te* is the definite article, and the attachment of it to *ava* does not mean that a different root is involved.

No fixed rule has yet been established to deal with this problem, though the modern tendency is to write such names as one word, especially when they are of the short conventionalized type found very generally throughout Polynesia, as cited

above. The definite article, however, is written separately. These principles have been generally followed in this volume, though account has been taken of local usage, as in Hawaiian place-names. For convenience of recognition most names of islets beginning with *Motu* have been written as two words. In conformity with a growing modern practice, hyphens have not been used.

Apart from differences as to the junction or separation of words in place-names, there are also many cases of variant spelling. Decision upon these is often a matter of great difficulty and no single authority can be taken for the area as a whole. For island names the spellings given in the *Lists of Oceanic Names* of the P.C.G.N., and for names of localities spellings given in the publications of the Bernice P. Bishop Museum of Honolulu record and sum up the most careful body of research, though even here there are some inconsistencies. These two series of publications have been used as the primary sources for the place-names given in this volume.

Meaning of Place-names

Meanings are often assigned to Polynesian place-names by translating literally their component elements. Much of this is mere speculation, since the component elements, usually single syllables or two-syllabled words, are often capable of a variety of meanings. Frequently only knowledge of the traditional or historical circumstances in which the place-name was given will allow of a correct interpretation. For instance, a landing on the west side of Mangaia known as Avarua (a common Polynesian place-name) might be translated as 'Twin Channel', or 'Channel with a Hole'; traditionally, however, it was so named by a party of Rarotongans who landed there and called it after the place in their own island from which they came.

Descriptive geographical names, however, a number of which occur in varying dialectal forms throughout Polynesia, may usually be translated with some confidence, and knowledge of the meaning of some of the commoner components will help the visitor in grasping the reference of such names to physical features. In the following list a form of the word which will be frequently found on maps is given first, and other dialectal variants of interest are appended:

Fenua, land—*Honua* (Hawaii); *Henua* (north Marquesas, Easter island); *'Enua* (Rarotonga, Mangaia); *Fanua* (Samoa).
Motu, island, islet—*Moku* (Hawaii).
Maunga, mountain—*Mauna* (Hawaii); *Maua* (Tahiti); *Mouka* (Marquesas).
Ava, channel—*Awa* (Pukapuka).
Fanga, bay—*Faa* (Tahiti); *Haka* (northern Marquesas); *Hana* (southern Marquesas); *Hono* (Hawaii).
Vai, water—*Wai* (Hawaii); *Pape* (Tahiti—a comparatively modern replacement of *vai* for reasons of taboo).
One, sand—*Oneone* (Samoa; Tonga; Marquesas).
Ana, cave.

Common adjectives often suffixed to the above include: *roa* (*loa* in Hawaii, Samoa), long; *nui*, large; *rahi*, large; *iti*, small; *tea*, light-coloured; *tapu* (*kapu* in Hawaii), sacred, holy—though the meaning when applied to an island, etc., has often lost its original significance. Other terms used as prefixes include: *mata*, face, eye; *mua*, forepart; *muri*, hindpart.

Place-names formed of combinations of such terms can often be understood, thus: Oneroa, a long sandy beach; Maungatea, a mountain with a light-coloured peak, bluff or hill side; Avaiti, a narrow channel; Matafenua, a prominent cape; Muafenua and Murifenua, opposite ends of an island; Faanui, a large bay; etc.

Appendix III

THE EASTERN PACIFIC ISLANDS SINCE 1939

This volume is concerned primarily with conditions in the Eastern Pacific islands before the outbreak of the present war, though incidental references have been made to conditions since 1939, in order to indicate where a description no longer applies or to bring tables of exports, etc., up-to-date without having to use elaborate footnotes. The purpose of this Appendix is to give a brief general picture of the situation after the outbreak of war. No part of the Eastern Pacific has been occupied by the enemy, but the dependence of the islands upon external markets, and their political ties with European countries, have necessarily caused them to be rapidly affected by the repercussions of war-time measures overseas.

Political Conditions

During the first year of the war no major political change took place. The various British and French colonies declared enthusiastically in favour of the war effort, and several of them made considerable contributions, in view of their size, towards the cost of the war. Both natives and Europeans shared the burden. But after the fall of France the status of the French Establishments in Oceania was revised. Though a small clique of officials endeavoured to maintain the colony as an appendage of Vichy France, the majority of the population appeared to be in favour of General de Gaulle. A referendum held on 1 September 1940, in Tahiti and the other islands where the people were French citizens, yielded a vote of 5,564 for continuing the struggle as invited by General de Gaulle, and only eighteen for accepting capitulation as ordered by Marshal Pétain. The Governor, M. Chastenet de Géry, then resigned and left the colony, and a new administration acting on behalf of Free France was then set up. Personal and political intrigue still persisted in official circles, however, and several dramatic changes of administration occurred in 1940 and 1941. But the general policy of the colony and the feelings of its people remained firmly attached to General de Gaulle, and many recruits offered themselves for the Free French Forces. More than 150 volunteers joined the Naval Forces, others served in the Air Force, and 300 Tahitians and others formed with recruits from New Caledonia the Bataillon du Pacifique which fought with great gallantry at Bir Hacheim and elsewhere.

The entry of Japan into the war on 7 December 1941 produced other reactions. Hawaii, which had borne the first brunt of the assault, was placed under a military governor, and the position and attitude of the large Japanese population (more than 20 % of whom were not United States citizens) became an important question. It appeared, however, that anti-American acts by local Japanese had been few, and in contrast to the wholesale evacuation of Japanese from the west coast of the United States, those of Hawaii were allowed to remain at liberty. This was due partly to lack of shipping for their removal, but also to the tradition of interracial co-operation which had long developed in the territory.

Economic Conditions

Though the war has not interfered directly with productive activity in the Eastern Pacific, as it has in the Western Pacific, the reactions on the economic system have been extensive.

The first marked effects were felt by agricultural producers. Not only was the German market for raw materials closed, but shortage of shipping soon began to limit exports to Britain and other European countries. Though prices on the London market remained fairly stable, stocks in the Pacific began to accumulate, particularly those of copra, a bulky freight in relation to its value. Warehouses, as at Papeete and Apia, began to be full to overflowing as time went on, and search was made for new outlets nearer than Europe, both by governments and private enterprise. Experiments were made in New Zealand in the use of low-grade copra as pig food and as a base for cattle food, and one commercial firm set up a copra crushing mill in Canada, though this was to deal mainly with copra from the Western Pacific. For French Oceania, Mexico and the United States became the principal copra buyers. The native producers in American Samoa, however, were in a specially favourable position till the end of 1941 owing to the relatively normal American shipping situation. Restriction of the export had its effect on local trade. In 1940, for instance, there were no branch stores in operation in the Tokelau group owing to the depressed state of the copra market.

Growers of other agricultural products tended to suffer less than those of copra, and in cases where shipping services were maintained, as between New Zealand and her island dependencies, the quantity and value of exports even rose in some cases. Some local benefits were also secured through war conditions. Owing to the curtailment of supplies of cocoa from West Africa, the demand for Pacific cocoa on the Australian market became keen, and in this the cocoa of Western Samoa shared. Again, with the increasing development of the United States naval base at Pango Pango there was not only a demand for labour from Western Samoa, with consequent inflow of cash to the territory, but also a good market was offered for bananas, pineapples, avocados and other fruit and vegetables.

Apart from agriculture the only product of prime importance from the Eastern Pacific is phosphate from Makatea. The market for this continued to be good, and Japanese shipments were considerable, though these were carefully scrutinized. After the destruction of the facilities at Nauru by German bombardment in December 1940, Japanese phosphate loadings from Makatea were restricted in favour of Australia and New Zealand.

The entry of the Japanese into the war tended to complicate the general export situation still further, since it made still heavier demands upon shipping for other than ordinary freight, and interfered with a number of Pacific trade routes. The Territory of Hawaii, which until then had enjoyed comparatively normal trade relations, was particularly affected. Not only were exports curtailed, but the sugar mills suffered from a shortage of jute bags, and the pineapple canneries from a shortage of tinplate. Incidentally, American paper currency in the territory was overprinted 'Hawaii' as a defence measure. A number of changes took place in the economy of the territory, mainly designed to make it more self-supporting. In particular mixed farming and vegetable growing were intensified. In Hawaii as in Western Samoa, after the Japanese capture of the rubber resources of Malaya and the Netherlands East Indies, every attempt was made to revive the rubber industry, though the quantities involved were only small.

As consumers also the people of the islands have felt the effects of the war. Shortage of shipping and other conditions have necessitated restriction of their imports. Many imported goods have become scarce, there has been some rise in the cost of living, and also price fixing and rationing of certain types of commodities. Goods of which the supplies have run short include cloth, shoe leather, paraffin, torch batteries, hardware, tinned foods (including milk, meat, vegetables and fruits), condiments and (in some areas) flour and sugar.

In Hawaii in the early part of 1942 imports were restricted by a licensing system, and there was a shortage of many imported goods, including foodstuffs; on occasion aircraft were used for transport of meat from the island of Hawaii to the city of Honolulu. In Tahiti there was no flour for three weeks in July 1941, and sugar was rationed at 1 kg. per person per month, the product of the single local mill being inadequate to meet requirements. Even in May 1942 when the situation had been

to some extent restored, flour was rationed there. In such situations natives perhaps tend to fare best, since they produce some foodstuffs, including fish, for their own needs; but even they depend on the maintenance of external markets for their supplies of clothing, lamp oil and steel goods, and on the export of their agricultural products for much of the cash needed to buy these commodities.

Another result of the war has been the development of new economic and political relations between the Eastern Pacific islands and the United States, Australia and New Zealand, and a re-orientation of trade. In the economic sphere, for example, shipments of raw materials from French Oceania to America led to the establishment of dollar credits there, and after the fall of France, when the franc was valueless in the American market, many types of imported goods could be obtained in French Oceania only by these dollar credits.

INDEX

Aala, 376
Aana, 613, 628 (table), 668 (fig.)
Abortion, 333
Acacia, 28, 29, 70, 76, 310
Acacia koa, 310, 311, 375
Academy bay, 24, 25, 37, 44, 46, 47, 48
Acaena argentea, 62
Actaeon, H.M.S., 224
Actaeon group, 223, 225–6; description, 224
Adams, John, 82, 86
Adams island, *see* Uapou
Adams rock, 79
Adamstown, 80, 85–6, 85 (fig.)
Adler, German corvette, 322
Administration, 3–4, 685; Austral is., 237, 247; Clipperton, 16–17; Cocos, 21; Cook is., 526, 527–9, 535, 539, 540 (fig.), 543 (fig.), 544, 546, 548, 556, 559; Easter, 77; French Oceania (general), 108–12; Galápagos, 37; Guadalupe, 11; Hawaiian is., 338, 339, 343, 346, 347, 348–56, 375, 377, 386, 392, 394–6, 397, 433, 434, 450, 451; Juan Fernández, 59; Line is., 475, 478, 483, 485; Mangareva, 234; Marquesas, 105, 273, 275, 278, 288; Niue, 569, 573, 575, 580; Phoenix is., 473, 495, 499, 500; Pitcairn, 82, 86–8; Rapa, 257, 258; Samoa, 591, 599–604, 613, 614, 622, 627–37, 628 (table), 638–54 *passim*, 663 (fig.), 676; Tokelau, 508, 514; Tuamotu, 201–2, 210, 212, 220, 222; *see also* Courts; Councils; Local government
Admiralty, Lords of, 312, 490, 549, 562; Reserve, 561
Adolphe, French vessel, 507
Adventists (*Kanito*), 200; *see also* Seventh Day Adventists
Adventure island, *see* Motu Tunga
Afaahiti, 155
Afareaitu, 127, 159, 160, 161, 161 (plate)
Afono bay, 670
'Agent spécial', 150, 237, 242
Agricultural Credit Bank, 125
Agricultural education, 530, 574, 643
Agriculture, 3, 692; Austral is., 227, 237, 239, 248–9; central equatorial is., 470–1, 490; Cocos, 21; Cook is., 529, 534, 539, 544, 545, 554, 556; Easter, 70, 74; French Oceania (general), 98, 108, 113–18 (with figs.), 121, 122, 125, 132; Galápagos, 48; Hawaiian is., 305 (plate), 325, 333, 351, 352, 353, 360 (fig.), 361 (fig.), 362 (fig.), 363 (fig.), 364 (fig.), 366–7, 370 (plates), 371 (plate), 372, 374, 382, 433; Juan Fernández, 60; Mangareva, 227, 235; Marquesas, 271–2, 274, 284; Niue, 572, 574; Pitcairn, 81, 83, 89; Rapa, 227, 257, 262 (plate); Samoa, 610, 622, 623 (fig.), 633, 646–51 (with tables and figs.); Society is., 144, 149, 150–1, 161, 162 (fig.), 163, 171, 177, 180, 185, 189; Tokelau, 512, 518; Tuamotu, 199, 202–3, 219, 220, 221, 223; *see also* Plantations; Ranching; *and under* names of crops
Aguila, Spanish frigate, 252
Aharoa, 101
Ahe, 194, 195, 681; description, 213
Ahi (fish), 376
Ahu (stone platforms), 65, 74
Ahukini, 410
Ahunui, 216
Ahupua, 333
Ahurei, bay, 98, 238, 253, 254, 254 (fig.), 255 (fig.), 256, 257, 258; village, 255 (fig.), 256, 258, 262 (plate)
Ai noa, 315
Aiea, 434
Aifa pass, 145–6
L'Aigle, British whaler, 488
Aimata, *see* Pomare IV (Queen)
Ainga-i-le-tai, 628 (table)
Air:
 Bases (potential), central equatorial is., 4, 453, 455, 475, 484, 485, 500; Clipperton, 13, 17; Cook is., 549, 556; Samoa, 587, 666; Society is., 126–7, 145, 172, 180; Tokelau, 516; Tuamotu, 204–5
 Communications, trans-Pacific, 2, 389, 447, 449, 472, 484, 494, 495, 496; *see also* Pan-American Airways
 Facilities, landing places, etc., central equatorial is., 472, 473, 474, 492 (fig.), 494, 495 (with fig.); Hawaiian is., 384 (fig.), 385 (fig.), 386–9 (with figs.), 404, 417, 422, 426, 429 434, 438, 447, 449, 451; Samoa, 637; Society is., 126–7, 178; Tuamotu, 205, 211, 212

Aitutaki, 487, 519, 522, 525, 534, 535, 538, 556, 562, 683; description, 549–51 (with fig.); population, 523 (table)
Akamaru, 227, 232
Akia, 311
Akiaki, 214; description, 215
Aku (fish), 376
Alataua, 628 (table)
Alawai canal, 397
Albany island, 49
Albatross, 312, 446
Albemarle island, *see* Isabela
Albemarle point, 31, 50, 54
Alcohol, 81, 112, 151, 257, 269, 381 (table), 631
Aleipata, 628 (table), 638, 669
Alert, H.M.S., 683
Aleurites moluccana, 81, 89, 183, 231, 256, 310, 311, 538, 544, 545, 566
Aleutian islands, 1
Alexander and Baldwin, 337
'Algaroba', 311, 440
Alia Matavai, 661
Alia Senga, 586, 661
Alii (Hawaiian nobles), 332
Ali'i (Samoan chiefs), *see* Rank, Samoa
Ali'i Sili, 600; *see also* Rank, Samoa
Allen, Port, 390, 404, 405, 405 (plate), 437, 438; *see also* Hanapepe bay
Alligator pear, 311
Aloafao, 674
Aloau bay, 670
Alocasia, 530, 566; *see also* Taro, giant
Alofi, 564, 573, 575, 577
Amanu, 194 (plate), 195, 681; description, 216
Amaru, 239
Amelia Earhart Light, 494
America, 22, 132; communications, E. Pacific, 2, 382, 392; relation to E. Pacific flora and fauna, 32, 33, 55, 64; *see also under* names of countries
American Board of Commissioners for Foreign Missions, *see* Sandwich Islands Mission
American Factors, 337, 393
American Federation of Labour, 380
American Guano Company, 468–9, 493
American President Line, 382, 434
Americans, fishermen, 38; sailors, 465; sealers, 59, 70; settlers, 106, 107, 177, 269, 316, 317, 318, 322, 323, 326, 327, 339, 341, 349, 352, 366, 518; traders, 104, 313; workmen, 72, 493; *see also* Economics, Hawaiian is.; History, central equatorial is., Hawaiian is., Samoa; Phosphate; United States; Whalers
Amiral, French frigate, 16
Amphitrite, Tahitian vessel, 224
Amyot bay, 211
Anaa, 194, 198, 202; description, 223
Anafai, 284
Anaho bay, 288
Anahola bay, 436
Anakee islet, 277
Anakena cove, 66, 67, 78
Anamoana pass, 243
Anapoto, 239
Anau, bay, 182, 183; village, 183, 184
Anauia, 284
Ancestors, spirits worshipped, 136
Anchorage island, 561
Anchorages, 5; Austral is., 239, 241, 243, 250; central equatorial is. (general), 453, 456; Clipperton, 15; Cocos, 19; Cook is., 537, 539, 548, 549, 550, 551, 553, 554, 557, 561; Easter, 66–7; French Oceania (general), 98; Galápagos, 24, 35, 42–54 *passim*; Guadalupe, 10; Hawaiian is., 305, 390, 392, 402, 405, 406, 407, 408, 409, 410, 410 (plate), 416, 421, 425, 428, 429, 433, 437, 442, 444, 446, 447, 451; Juan Fernández, 57, 61–2, 63; Line is., 476, 479, 481, 484, 486, 488, 489, 491; Mangareva, 230; Marquesas, 264, 277–8, 280, 282, 284, 288, 292, 297, 298; Niue, 564; Phoenix is., 494, 496, 497, 498, 500, 501; Pitcairn, 80; Rapa, 254, 256; Revilla Gigedo, 12; Samoa, 587, 662, 666, 667, 670, 673, 674, 675; San Felix and San Ambrosio, 55; Society is., 145–7, 153, 154 (plate), 159, 161 (plate), 165, 169–70, 172, 173, 176, 179, 182; Tokelau, 505, 517; Tuamotu, 194 (plate), 195, 207, 210–26 *passim*
Anchovy, 376, 377
Andes, 311
Andía y Varela, Don Joseph de, 216, 252
Andrees Allgemeiner Handatlas, 452
Andropogon, 134
Angatau, 198, 202; description, 219
Angataura, 546
Anglo-American, relations, *see* Great Britain; United States; Exchange of Notes, 473, 497
Animals, *see under* names of species
Aniwa, 579
Anna Maria bay, *see* Taiohae bay
Annamites, *see* Indo-Chinese
Antarctic, 58, 643
Anthropology, 6, 99; physical, *see* Polynesian, physical type
Ants, 34, 184
Anua, 660

Anuanuraro, 226
Anuanurunga, 225–6
Anvil, the, *see* Yunque, El
Aoa bay, 673
Aorai, 136, 151 (plate)
Apataki, 195, 201, 203, 204, 213, 681; description, 212
Apia, 2, 521, 577, 603, 604, 605, 608, 634, 638, 645, 645 (plate), 648, 652, 655, 665, 666, 692; administration, 596, 598, 599, 628, 630; climate, 588–9; communications, 516, 535, 579, 580, 622, 656–7, 664, 669, 673; history, 469, 592, 593, 597, 599; hospital, 639; industry, 651; population, 606, 657; port, 507, 655–6 (with fig.), 656 (plate); town, 657; trade, 653, 659
Apia Observatory, 643–4, 657
Apolima, 582, 610 (plate), 613, 628 (table), 684; description, 664–5
'Appontements', *see* Wharves
Apu bay, 179
Araara pass, 168, 169
Arakchéev island, *see* Angatau
Aratika, 203; description, 211
Archaeology, 99; Austral is., 250; central equatorial is., 464, 480, 487, 488 (fig.), 490, 493, 499, 500; Easter, 64–5, 65 (plate), 76 (plate); Pitcairn, 82; Society is., 136; Tuamotu, 200, 201 (fig.); *see also* Temples
Archangel island, *see* Anuanuraro
Archipiélago de Colón, *see* Galápagos
Area, village, 256, 258
Ariki (chief), *see* Rank
Aristotelia maqui, 62
Armed forces, 16, 17, 20, 21, 36, 37, 38, 39, 42, 48, 52, 112, 327, 349, 381, 434, 527, 600, 691
Aroids, 483; *see also Alocasia*; Taro
Arorangi, 537
Arrecife Schiavoni, 41
Arrowroot, Polynesian, *see Tacca pinnatifida*; 'Arrowroot' starch, *see* Tapioca
Artémise, French frigate, 316
Arue, 137 (plate), 143, 155
Arundel, John T., 468–71, 488, 489, 490, 491, 493, 497, 498, 500, 501, 502
Arundel, John T., and Company, 471; *see also* Arundel, John T.
Arutua, 204; description, 212–13
Arutunga, 549, 550, 551
Asau harbour, 661, 662
Ash, *see* Rocks, volcanic
Asiatics, 3, 4, 196, 343, 346, 373; *see also* Chinese; Filipinos; Indo-Chinese; Japanese; Koreans
Asiatic-Hawaiians, *see* Part-Hawaiians
Asparagus, 382
Asplenium nidus, 268, 311, 463, 463 (plate), 560
Assam, 306
Asses, *see* Donkeys
Assimilation, French policy, 110; American educational policy, 341, 352, 353
Associated Oil Co., 393
Ataeva bay, 284
Atafu, 504–16 *passim*, 683; description, 505 (fig.), 517
Ataiti, Port, 142, 146
Atihu bay, 288
Atimaono, basin, 145–6; plantation, 121–2
Atiu, 469, 519, 522, 525, 527, 534, 535, 545, 546, 549, 683; description, 546–9 (with fig.); population, 523 (table)
Atolls, Austral is., 236, 238; central equatorial is., 454 (fig.), 454 (plate), 454–64 *passim*, 475–81 (with figs.), 483–5 (with fig.), 490, 494–501 (with figs.); Clipperton, 13, 14 (fig.); Cook is., 520, 549–62 (with figs.); Ducie, 92; Hawaiian is., 444, 445, 446, 447–51 (with fig.); Niue (elevated), 563; Oeno, 91 (with fig.); Samoa, 585, 675; Society is., 129, 130, 164 (fig.), 189; Temoe, 236; Tokelau, 501–5 (with fig.), 518; Tuamotu, 96, 192–226 (with figs.) *passim*, 194 (plate), 234; *see also* Island types
Atua, 613, 628 (table), 668 (fig.)
Atuakoro, 544
Atuona, 127, 264, 265, 269, 273, 278, 288, 302 (plate); bay, 277 (fig.); settlement, 274, 278; valley, 262, 276
Au o Tu, Te, 549
Auau channel, 426
Auckland, 561, 657
Auera, 186
Aukena, 227, 230
Aunu'u, 537 (plate); description, 673
Aurora island, *see* Makatea
Austral islands, 4, 76, 95, 96, 104, 121, 126, 151, 232; description, 236–52 (with figs.)
Australia: 2 (fig.), 320, 374, 693
 Communications, 180, 382, 434, 654, 660
 Trade, 692; central equatorial is., 469, 471, 481; French Oceania, 115, 117, 120, 123 (with fig.), 208; Hawaiian is., 319, 380; Niue, 579; Samoa, 653 (table), 654 (fig.)
'Au'ura, 197; *see also* Kaukura

Ava (herring), 161
'*Ava*, *see* Kava
Avamoa pass, 169, 170
Avanui, Te, pass, 98, 182; harbour, 182
Avapeihi pass, 169, 170
Avapiti, Te, pass, 173
Avaroa, pass (Moorea), 159
Avaroa, Te, pass (Takaroa), 211
Avarua (Rarotonga), 520, 528, 529, 530, 535, 537, 539, 542, 544, 683; harbour, 541 (with fig.)
Avarua, Te, pass (Raiatea), *see* Avapiti, Te
Avatele (Niue), 564
Avatele (Samoa), 643; passage, 662
Avatika pass, 212
Avatiu, 528, 537, 539, 683; harbour, 541 (with fig.)
Avatoru, pass, 213, 681; village, 213
Avele, 641, 642
Avera, bay, 209 (plate), 241; village, 242
Averaiti bay, 173, 176
Averarahi bay, 173
Averetini islet, 224
Avocado pear, 150, 375, 382, 539, 692
Azolla, 40

'Bacalao', 38, 58, 60
Bacalao, Punta, 56, 61
Bachelor's Delight, ship, 19, 35
Baerau, 480
'Bagasse', 374, 377
Bahía, *see under* proper names
Baker island, 2, 452, 454, 457, 459, 460, 462 (plate), 464, 466, 467, 468, 469, 472, 473, 474, 475, 477, 493, 683; description, 491–3 (with fig.)
Baker, whaling master, 493
Baltra, 28, 31, 32, 47
Bamboo, 118, 134, 231, 245, 268; hats, 249; pipes, 267
Bananas, 38, 42, 70, 81, 134, 149, 170, 177, 180, 183, 185, 202, 211, 215, 219, 231, 235, 239, 245, 256, 257, 271, 302 (plate), 311, 333, 374, 483, 506, 512, 518, 522, 530, 539, 548, 556, 558, 560, 565, 566, 574, 610, 622, 652; mountain, wild, *see Musa fehi*; trade, 150, 161, 248, 381, 530, 531 (fig.), 533 (fig.), 534, 539, 545, 546, 576, 578 (fig.), 579, 637, 646 (table), 647, 649–50 (with fig.), 653, 654 (fig.), 656, 692; varieties, 248, 272, 566, 648; *see also* Plantations: Banana
Banfield (Vancouver island), 481
Banks, Sir Joseph, 136
Banyan, 149, 183, 208, 231, 245, 538, 566
Baquedana, Bahía, 47
Baquerizo Moreno, Puerto, 40; *see also* Chico, Puerto
Barbers point, 432, 433
Barclay de Tolly island, *see* Raroia
Bark cloth, 283, 310, 611, 626; *see also Broussonetia papyrifera*; Clothing
Barking Sands, 438; airfield, 386, 388 (fig.)
Barracouta, H.M.S., 596
Barranca, the, 45
Barrington, *see* Santa Fé
Barringtonia, 134, 149, 176, 538, 548; *asiatica*, 208, 590
Barrow, *see* Vanavana
Barstow, Frederick Duclos, Foundation, 643
Barter, 89, 252; *see also* Trade
Basalt, 54, 65, 136, 140, 142 (plate), 145, 228, 236, 261, 263 (plate), 308, 426, 440, 442, 445, 537, 542, 586, 590, 624
Bass Rocks, *see* Marotiri
Bassa, Punta, 41, 42
'Bataillon du Pacifique', 691
Bats, 32, 268, 567, 590
Baux island, *see* Nukuhiva
Bay, *see under* proper names
Beach crest (central equatorial islands), 455, 462, 477, 478, 480, 481, 482 (fig.), 483, 484, 485, 486, 487, 492, 494, 496, 497, 498, 501
Beaches, Austral is., 239; central equatorial is., 455, 455 (plates), 479, 480 (plates), 481, 485, 486, 488, 489, 491, 492, 493, 494, 496, 497, 498; Clipperton, 15; Cocos, 19; Cook is., 520, 537, 542, 546, 549, 560; Easter, 66; Galápagos, 24, 31, 33, 40, 46, 47, 53; Guadalupe, 10; Hawaiian is., 304 (plate), 398, 399, 405, 409, 410, 410 (plate), 411 (plate), 415, 420, 421, 424, 427, 429, 432, 437, 439, 440, 450; Juan Fernández, 63; Mangareva, 230; Marquesas, 262, 263 (plate), 263, 277, 279, 284, 287, 292, 296, 297; Pitcairn, 80; Rapa, 254; Revilla Gigedo, 11, 12; Samoa, 587, 662, 670, 674; Society is., 136 (plate), 137 (plate), 143, 144, 146, 153, 182; Tokelau, 517; Tuamotu, 194, 206, 211, 215
Beagle, H.M.S., 36, 223, 679
'Bêche-de-mer', 91, 637
Beck cove, 429
Beechey, Captain F. W., 70, 194, 216, 218, 225, 680, 681
Belcher, Captain Sir Edward, 679
Belgians, 121

Bellingshausen, Vice-Admiral Fabian, 209, 211, 219, 221, 222, 465, 489, 555
Bellingshausen island, *see* Motu One
Benito, *see* Graham, Bennett
Benjamin Tucker, whaler, 238
Berkeley, cape, 24, 50
Berlanga, Bishop Tomás de, 35
Berlin Treaty, 598, 631, 633, 634
Bernice Pauahi, Princess, *see* Pauahi, Princess Bernice
Bernice Pauahi Bishop Museum, 6, 9, 352, 680, 689, 690
Beru island, 471
Betsy, American ship, 465, 480
Bibliographical notes, 92–4, 127–8, 190–1, 226, 259, 298–9, 411–12, 451, 502–3, 580–1, 676
Bicknell, George, 483
Bicycles, 209, 242
Bindloe, *see* Marchena
Bingham, Hiram, 315, 352
Bir Hacheim, 691
Birds, 24, 55, 499, 507, 548, 590; land, 11, 81, 160, 161, 170, 177, 184, 197, 208, 268, 464, 483, 567, 624; sea, 13, 14, 16, 20, 21, 33, 55, 58, 70, 197, 245, 312, 445–6, 448, 450, 464, 467, 483, 487, 488, 489, 490, 493, 494, 496, 497, 500, 501, 502, 507, 560, 561, 567, 676; shore, 33, 184, 231, 245, 464; as food, 238, 272, 285, 553; breeding places, 14, 53, 54, 81, 186, 285, 295, 298; cult, 75–6, 77; eggs as food, 6, 87, 553; *see also* Poultry; Reserves; *and under* names of birds
Birnie, James, 466
Birnie island, 453, 459, 466, 467, 472, 473, 683; description, 496–7
Birs cove, 47
Birth-rate, 83, 342, 329, 524, 570, 604, 605
Bishop Museum, *see* Bernice Pauahi Bishop Museum
Bishop of Osnaburgh's island, *see* Mururoa
Black Beach, 44
Black Beach road, 44, 679
'Blackbirding', *see* Labour traffic
Black rock, 537
Bligh, Captain William, 100, 101, 225, 549
Blonde, H.M.S., 316, 466, 487
Blonde reef, 401
Blossom, H.M.S., 194
Blowholes, 263
Boards, governmental, *see* Administration
Boats, 77 (plate), 80, 86, 87, 89, 258; *see also* Canoes; *Fautasi*; Sailing craft
Boenechea, Don Domingo, 161, 163, 214, 217
Boerhaavia, 450, 477, 480, 493, 496; *tetrandra*, 463, 486, 676
Bog, *see* Swamp lands
Bon Repos bay, *see* Omoa
Bonito, 185, 512, 553, 574, 611, 619 (fig.), 624, 625
Boobies, *see* Booby gannets
Booby gannets, 33, 70, 231, 285, 298, 462 (plate), 463 (plate), 464, 496, 676
Borabora, 98, 100, 103, 129, 133, 135, 179, 182 (plates); description, 180–5 (with fig.), 189, 680
Boston, Mass., 312, 315
Bosun birds, *see* Frigate birds
Boudeuse pass, 147
Bougainville, Chevalier Louis Antoine de, 100, 192, 214, 216, 591, 686
Bougainville anchorage, 147
Bougainville island, 598
Bounty, H.M.S., 82, 83, 89, 100, 101, 245, 507; *see also* Bligh; Pitcairn
Bounty bay, 77 (plates), 80 (with figs.)
Bourayne, Port, 170
Bow island, *see* Hao
Bowditch island, *see* Fakaofu
Bracken, 30, 33 (plate), 40, 165, 276, 538
Braithwaite bay, 12
Brandeis, Captain, 597
Brander, John, 71, 72, 562
Brattle island, *see* Tortuga
Brazil, 370, 372
Bread, 219, 252
Breadfruit, 81, 109 (plate), 117, 132, 177, 180, 183, 185, 208, 211, 231, 239, 242, 245, 256, 264, 267, 271, 272, 279, 284, 302 (plate), 311, 333, 506, 518, 538, 539, 556, 558, 562, 566, 612, 622, 626, 647; bark, 272; god, 233; leaves, 272; preserved, 235, 272, 273; timber, 134, 272, 611
Breaker point, 658
Brewer, C. C., and Co., 337
Brewery, 151
Bridges, *see* Roads
Britain, *see* Great Britain; British; English
British, 35, 56, 317, 465–75 (with figs.) *passim*, 691; discoverers, 465 (*see also under* names of men and ships); scientific expeditions, 6, 283, 490, 491; sealers, 59; settlers, 72, 121, 326, 327, 518; traders, 313, 523; whalers, 465–7; *see also* Australia; Great Britain; New Zealand; *and under* names of dependencies
Brooks, N. C., mariner, 444

Broom Road, 155
Broughton, Captain, 465, 490
Broussonetia papyrifera, 81, 231, 245, 548, 622, 626
Brown, mariner, 466, 486
Bubonic plague, 354
Buddhism, 340
Budget, *see* Finance
Bulrushes, *see* Reeds
Bunch-grass, *see Lepturus* bunch-grass
Burma, 117, 653
Burns, Philp (South Sea) Company, 471, 480, 483, 499, 656
Burros, *see* Donkeys
Bursera, 29
Bushnell, U.S.S., 500, 502, 683
Butter, 117; *see also* Dairy farming; Food, imported
Byam Martin, *see* Ahunui
Byron, Captain Lord, 316, 466, 487
Byron, Commodore Hon. John, 211, 219, 507, 558

Cabbage, 340, 374
'Cabbage tree', *see Cordyline*
Cabinet making, *see* Furniture making
Cable landings, *see* Landings; Ropeways
Cable, submarine, 389, 453, 497, 501; station, 449, 471, 473, 475, 479, 481, 481 (plate)
Cactus, 12, 29, 32, 54; *see also Cereus*; *Opuntia*
Cadmus, *see* Morane
'Caisse Agricole', *see* Agricultural Credit Bank
Calabash (plant), 310
Caldera, 24, 53, 283 (fig.), 304
California, 318, 351, 360, 367, 368, 371, 373, 375, 393, 491
Calliope, H.M.S., 597
Calophyllum inophyllum, 149, 183, 207, 480, 490, 521, 538, 548, 554, 558, 560, 566
'Camotes', *see* Sweet potatoes
Canada, 126, 380, 481, 653, 692
Canadian-Australasian Line, 382, 434
Canadian-Pacific Line, 383, 434
Canals, 481
Canary, *see* Laysan canary
Cancer, 354
Candlenut, *see Aleurites moluccana*
Canneries, 378, 488, 434; fish, 60, 359, 376, 380; pineapple, 113, 151, 359, 367, 368, 369, 377, 380, 421, 438, 692
Cannibalism, 76, 105, 225, 233, 272
Canoes, 74, 219, 220, 229, 334, 464, 478, 479, 505, 509, 511, 516, 517; Austral is., 247, 249; Cook is., 530, 536 (plate), 537, 542, 543, 545, 552, 553, 554, 556, 557, 558–9, 560, 574; Hawaiian is., 310; Mangareva, 233; Marquesas, 263 (plate), 272, 274; Pitcairn, 85, 89; Rapa, 258; Samoa, 610, 610 (plates), 624, 625–6 (with fig.); Society is., 109 (plate), 134, 135, 161, 171, 176, 178, 180, 185; Tokelau, 512–13, 516, 518; *see also* Sailing craft
Canton (China), 314
Canton, New Bedford whaler (wrecked), 494
Canton island, 2, 4, 453, 454, 456, 459, 464, 466, 469, 472, 473, 474, 475, 485, 497, 500, 683; description, 494–6 (with fig.)
Canyon, 302
Cape, *see under* proper names
Cape gooseberry, 567
Capsicum, 248
Cararva (wreck), 42
Carnegie Institution, 676
Caroline island, 121, 452, 454, 460, 463, 465, 469, 470, 471, 473, 475, 485, 491, 683; description, 489 (fig.), 490
Cartago bay, 51, 679
Cartels, 368
Carter point, 405
Carteret, Lieut. Philip, 82, 224, 225, 226
Carteret anchorage, 63
Carvajal, Bahía, 61
Carvings, *see* Archaeology; Craftwork; Script; Statues; Tablets
Carysfort, H.M.S., 317
Cascara island, 19
Cassava, *see* Manioc
Castellanos, Francisco de, 35
Castle and Cook, 337
Castor oil plant, 117
Casuarina, 183, 184, 242, 243, 245, 267, 445, 446, 538, 544, 548
Catedral, Roca, 55
Catholics, *see* Roman Catholic church and missions
Cats, 11, 196, 268, 312, 487, 500, 507
Cattle, 12, 30, 32, 42, 43, 44, 48, 60, 70, 77, 117, 151, 178, 184, 237, 242, 249, 257, 274, 297, 311, 312, 373, 374, 381, 399 (tables), 406, 409, 428, 430, 440, 539, 551, 574, 590, 647, 651; *see also* Dairy farming; food, 399 (table), 402, 440, 692; stagings, *see* Jetties and piers
Catton, Neill and Co., 397
Caucasian-Hawaiians, *see* Part-Hawaiians
'Caucasians', 313, 326, 327 (and table), 378

Caves, 46, 542, 544, 546, 564, 566; as refuge, 71, 544
Cement, 393
Centipedes, 34, 184, 591
Central equatorial islands, 4, 454 (plates), 455 (plates), 462 (plates), 463 (plates), 480 (plates), 481 (plates), 504, 682; general description, 452–75 (with figs.); individual islands, 475–502 (with figs.)
Central Medical School (Suva), 530, 577, 639
Central Pacific Cocoanut Plantations, 471, 478
Central Polynesian Sporades, 452
'Central-polynesische Sporaden', 452
Cephalic index, *see* Polynesian, physical type
Cereals, 117, 120, 340; *see also under* names of varieties
Cereus, 15 (plate), 45
Cerro Amarillo, 55
Ceylon, 591
Chain island, *see* Anaa
Chalmers, cape, 53
Chamber, of Agriculture, 108, 109; of Commerce, 108, 109, 341; of Deputies, 109
Champion, H.M.S., 450, 682, 683
Chanal island, *see* Hatutu
Charles I, King of Spain, 35
Charles island, *see* Floreana
Charles Nelson Line, 401
Charts, 6, 135, 194, 243, 278, 285, 393, 397, 434, 452, 678–84 *passim*, 689
Chastenet de Géry, Governor, 691
Chatham, brig (wrecked), 552
Chatham bay, 18 (fig.), 19
Chatham island (Galápagos), *see* San Cristóbal
Chatham islands, 1
Chave, *see* Haave
'Chef du Service judiciare', 110
Chico, Puerto, 24, 37, 39, 40, 42, 43, 679
Chile, 4, 22, 55, 58, 59; and Easter, 64, 71, 72, 74, 77, 78; and Juan Fernández, 47 (plate), 56, 59; and Sala y Gomez, 78; and San Felix and San Ambrosio, 54
China, 117, 120, 123, 124 (fig.), 314, 377, 380; *see also* Chinese
Chinese, Austral is., 239, 245, 248–9, 252; central equatorial is., 480; Cook is., 524; Easter, 72; French Oceania (general), 106–7, 115, 118; Hawaiian is., 320, 321, 326–47 (with figs. and tables) *passim*, 349, 350 (table), 355, 359 (fig.), 366, 371, 378 (with table), 381; Marquesas, 105, 269, 274, 278; Samoa, 606, 607, 631; Society is., 113, 117, 121, 150, 151, 154, 160, 161, 171, 177, 178, 180, 184, 185, 189; Tuamotu, 197, 203, 208, 212, 215, 216, 219; *see also* Labour: Chinese Population; Settlements
'Chinese disease', *see* Leprosy
Cholera, 354
Chonta, *see* Palms
Christian, Fletcher, 82
Christian, point, 79
Christianity, Austral is., 242, 245, 247; Cook is., 522, 527, 548, 552, 556, 558, 566; Hawaiian is., 340; Mangareva, 232; Niue, 567, 568, 572, 575; Pitcairn, 86; Samoa, 615, 646; Society is., 102, 103, 108, 136, 160; Tuamotu, 197, 200, 220–1; *see also* Churches; Missions; Protestant churches and missions; Roman Catholic church and missions
Christmas island (Line is.), 376, 453, 454, 455, 456, 460, 461, 463, 464, 465, 469, 470, 471, 472, 473, 481 (plate), 683; description, 475–8 (with fig.)
Christopher, point, 50
Churches, 151 (plate), 232–3, 255 (fig.), 302 (plate), 644, 644 (plate), 645 (plate); *see also* Protestant churches and missions; Roman Catholic church and missions
Cinchona, 113
'Circonscription, Chef de', 273
Citizenship, French Oceania, 107, 109–10, 150, 201, 202, 237, 273, 691; Hawaiian is., 327, 329, 342, 343, 346, 347, 349, 691; Samoa, 601, 607
Citrus fruits, 117, 149, 248, 252, 374, 521, 522; *see also* Lemons; Limes; Oranges; Shaddock
Clam, 464; giant, *see Tridacna*
Clarion island, 12
Clermont-Tonnerre, *see* Reao
Cleveland, Grover, 323
Cleveland, U.S.S., 16
Climate, Austral is., 237; central equatorial is., 456–61 (with figs.), 476–1, 479–80, 481–2, 484, 485, 486–7, 490, 491, 492, 493, 497; Clipperton, 15–16; Cocos, 19; Cook is., 520, 527, 537, 554, 558; Easter, 67–8, 69 (fig.); French Oceania (general), 98; Galápagos, 24–7, 26 (fig.), 27 (fig.), 43; Guadalupe, 10; Hawaiian is., 305–8, 306 (fig.), 307 (figs.), 309, 311, 339, 358, 359, 366, 373, 374, 375, 390, 404, 413, 416, 418, 427, 428, 429, 430, 440, 448, 449;

Juan Fernández, 58, 64; Malpelo, 21; Mangareva, 230–1; Marquesas, 264–6, 282, 284, 285, 297; Niue, 564–6 (with figs.); Pitcairn, 80–1; Rapa, 256; Samoa, 587–90 (with fig.), 676; Society is., 129–30, 147–8, 183, 187–8; Tokelau, 505–6; Tuamotu, 195–6
Clipperton, Captain, 13, 20
Clipperton island, 11, 13–17, 14 (fig.), 95, 679; rock, 14, 14 (plate)
Clothing, 85, 86, 120, 185, 221, 273, 340, 380, 381 (table), 608, 638, 653
Clubmoss, *see Lycopodium*
Clubs and societies, 107, 154, 339, 340, 341, 347
Coal, 120, 153, 399 (tables); coaling stations, 13, 256, 319, 594; lignite, 253 (fig.), 257
Coastal flats, Austral is., 236; Cook is., 541; Hawaiian is., 420; Marquesas (absent), 262; Samoa, 586, 587; Society is., 136 (plate), 137 (plate), 140, 143, 144, 157–8, 161, 161 (plate), 165, 167, 171, 172, 173, 177, 179, 180
Coasts, Austral is., 241; central equatorial is., 455–6, 455 (plate), 485; Clipperton, 15; Cocos, 19; Cook is., 520, 536 (plate), 537, 537 (plates), 541, 543, 545, 546, 549, 553, 557, 560, 561; Easter, 64 (plate), 65 (plate), 66–7; Galápagos, 24, 40–1, 43, 44, 46, 48, 49, 50–2; Jean Fernández, 57, 60–1, 63; Hawaiian is., 304 (plates), 304–5, 366, 410 (plate), 411 (plate), 414 (plates), 415–16, 420–21, 420 (fig.), 422, 424, 425, 427–8, 429, 430, 432–3, 433 (plates), 436, 437, 439; Mangareva, 228, 229–30; Marquesas, 262, 263 (plates), 263–4, 277, 281, 284, 285, 288, 291–2, 296–7, 296 (fig.), 297; Niue, 564; Pitcairn, 79–80; Rapa, 254; Revilla Gigedo, 12; Samoa, 586 (plates), 587, 589, 661–2, 666, 670, 673; Society is., 136 (plate), 137 (plates), 142–5, 143 (plates), 155 (plate), 159–60, 167–70, 172–3, 179, 182; Tuamotu, 183 (plate), 194–5, 206, 209–26 *passim*
Cobos, Don Manuel J., 36; Señor, 37, 42
Cockburn, *see* Fangataufa
Cockscomb, island, 670; point, 670
Cocoa, 634, 636, 637, 643, 646 (with table), 648, 649 (fig.), 653, 654 (fig.), 656, 692
Coconut, 219, 235, 274, 490, 515, 519, 531, 549, 647, 667; as drink, 97, 196, 219, 220, 245, 551, 612, 619; as food, 17, 85, 333, 512, 530, 545, 553, 556, 612, 619; by-products, 113, 115, 651; oil, 121, 239, 470, 481, 490, 523, 593, 646, 647; sennit cordage, 249, 512, 625; *see also* Coconut palms; Copra
Coconut palms:
Central equatorial is., 454 (fig.), 454 (plate), 463 (plate), 477, 480, 497; Clipperton, 16; Cocos, 20; Cook is., 520 (plate), 538, 544, 548–62 *passim*; French Oceania, 98, 108, 111, 130, 134, 137 (plate), 143, 149, 169, 177, 183, 183 (plate), 188, 194 (plate), 196, 202, 207–26 *passim*, 229, 231, 243, 245, 249, 256, 267, 302 (plate); Hawaiian is., 445; Niue, 566; Oeno, 91; Pitcairn, 81; Samoa, 590, 610, 622, 673, 674, 675, 676; Tokelau, 521–2
European Cultivation, 483–95 *passim*, 518; *see also* Plantations: European
Native cultivation, 113, 164, 170, 186, 190, 192, 196, 212, 213, 219, 220, 222, 236, 248, 271, 284, 297, 496, 501, 515, 554, 556, 558, 560, 568, 573, 574, 610, 622, 647–8; use of leaves, 134, 220, 249, 509, 511, 515; use of timber, 134; varieties, 272
Cocos island, 2, 4, 10, 17–21, 18 (fig.), 679
Coffee, Cook is., 544, 545, 548; French Oceania, 115–16, 124, 161, 183, 235, 237, 248, 252, 257, 273, 274; Galápagos, 38, 42; Hawaiian is., 357, 358, 360 (fig.), 369, 376, 380, 381 (table), 399 (tables), 407, 416; Samoa, 646; *arabica*, 113; blight, 370; *see also* Plantations: Coffee
Coffin, James J., 466, 497
Coffin, Joshua, 466, 501
Collie and Lucett, 470, 480, 490
Collingwood, H.M.S., 101
Colnett, Captain James, 20, 679
Colocasia, *see* Taro
Colombia, 4, 21
Colón, Archipiélago de, *see* Galápagos; Cristóbal, *see* Columbus, Christopher
Colonization, central equatorial is. (general), 472, 493; Line is., 475, 486; Phoenix is., 472, 496, 497, 499, 500, 501, 502; Tokelau, 518
Columbus, Christopher, 22
Commerce, *see* Trade
Commissions, 273, 335, 350, 601, 602, 603, 631, 633–4; *see also* Councils
Communications, 2; Austral is., 237–8, 239, 242, 249–50, 252; central equatorial is. (general), 453, 474–5, 478; Clipperton, 17; Cocos, 21; Cook is., 534–5, 539–42 (with figs.), 545, 546,

549, 551, 553, 556, 560, 561, 562; Easter, 78; French Oceania (general), 108, 109, 125–7; Galápagos, 39, 40, 43, 44; Guadalupe, 11; Hawaiian is., 357, 383–9 (with figs.), 383 (plate), 390, 402, 404, 406, 417, 421, 425–6, 429, 434–5, 438, 440, 692; Juan Fernández, 47 (plate), 60; Line is., 481, 483, 490, 491, 493; Mangareva, 233, 235–6; Marquesas, 274, 277–8, 283, 290; Niue, 569, 579–80; Phoenix is., 495, 497, 500, 501; Pitcairn, 90; Rapa, 258; Samoa, 614, 654–60 (with figs.), 662–4 (with fig.), 667–9 (with fig.), 672 (fig.), 673; Society is., 154–5, 161, 171–2, 178, 180, 185, 189; Tokelau, 516; Tuamotu, 204–5, 209, 211, 220; *see also* Roads; Shipping; Signal communications
'Compagnie Coloniale de l'Océanie', 284
'Compagnie des Messageries Maritimes', 115, 125, 155, 171, 178, 185, 274, 290
'Compagnie Française des Phosphates de l'Océanie', 153, 208, 209, 211
'Compagnie Française de Tahiti', 190
'Compagnie Franco-Tahitienne', 274
'Compagnie Immobilière et Agricole de Tahiti', 171
'Compagnie Navale de L'Océanie', 274
Compañia Explotadora de la Isla de Pascua, *see* Williamson, Balfour Company
Companies, industrial, 151, 153, 178, 208, 209, 211, 377, 397; pastoral, 69–78 *passim*, 274; phosphate, 468–70; plantation, 116, 121, 171, 190, 224, 238, 269, 284, 471, 499; shipping, 90, 115, 125, 171, 178, 382–3; trading, 274, 337–8, 656; transport, 393, 669; *see also under* names of individual companies
Compositae, 30, 62
Comptroller bay, *see* Controleur bay
Concessions, 562; export, 297; land, 634; pearling, 561; phosphate, 469, 488, 489; plantation, 284, 478, 499, 549, 560; *see also* Land: Alienation and claims
Condominium, Canton and Enderbury islands, 473
Cones, volcanic, 22, 24, 43, 44, 46, 46 (plate), 49, 50, 56, 137, 138, 140 (fig.), 156, 162, 178, 281, 282, 283 (fig.), 285, 413, 414, 415, 418, 421, 430, 432, 435, 436, 437, 439, 441, 543, 660, 664, 665, 673; (parasitic), 22, 23, 24, 46, 49, 65, 415, 660, 661; (tuff or cinder), 13, 23, 24, 44, 49, 302, 413, 415
Congregationalists, *see* London Missionary Society
Conic island, 19
Conjunctivitis, *see* Eye diseases
'Conseil Supérieur de la France d' Outremer', *see* Councils and Committees: France
Controleur bay, 264, 287 (fig.), 288
Convolvulus, 309; *see also Ipomoea pescaprae*
Conway bay, 47
Cook, Captain James, 70, 73, 100, 101, 103, 104, 136, 143, 146, 167, 216, 217, 218, 222, 223, 239, 245, 250, 284, 312, 316, 323, 326, 334, 359, 407, 465, 477, 522, 527, 544, 548, 549, 562, 567, 686
Cook bay (Easter), 72, 74, 680
Cook bay (Moorea), *see* Paopao bay
Cook island (Christmas island), 476
Cook islands, 4, 99, 121, 198, 234, 236, 245, 490, 493, 508, 520 (plate), 521 (plates), 536 (plates), 569, 576; administration, 523, 527–9, 534, 569; general review, 519–535 (with figs.)
Lower Cook Group, 504, 519 (with fig.), 519–35 *passim*; 535–51 (with figs.)
Northern Cook Group, 452, 453 (fig.), 485, 504, 508, 519–35 *passim*, 551–62 (with figs.)
Cooking, 134, 247
Cook's harbour (Huahine), *see* Haavai bay
Cook's inlet (Huahine), *see* Haavai bay
Co-operative associations, French Oceania, 125, 126, 202, 203, 220, 242; Phoenix is., 472, 500; Samoa, 600
Copra, 692; Austral is., 237, 238, 239, 242, 247, 248, 249, 252; central equatorial is., 478, 480, 481, 483, 490, 491, 499; Cook is., 529, 530, 531 (with fig.), 532 (fig.), 546, 549, 553, 556, 557, 560, 561, 562; French Oceania (general), 113–15 (with fig.), 122, 123, 126; Mangareva, 236; Marquesas, 265, 274, 280; Niue, 568, 576, 577, 578 (fig.), 579; Samoa, 598–9, 601, 615, 622, 623 (fig.), 636, 637, 643, 646 (with table), 647–8, 649 (fig.), 652, 653, 654 (with fig.), 656, 660, 662, 669; Society is., 132, 150, 161, 165, 171, 177, 178, 180, 185, 186, 189, 190; Tokelau, 509, 511, 512, 515, 518; Tuamotu, 197, 199, 202, 203, 204, 211, 213, 214, 215, 216, 219, 220, 221
Coprosma, 538
Coquille, La, French corvette, 214

Coral, 14, 24, 57, 129, 165, 254, 256, 263–4, 447, 456, 482, 483, 484, 676; *see also* Atolls; Coral reefs; Island types; Limestone; *Makatea* (raised reef)
'Coral' islets, 298
Coral reefs:
General, 2, 8 (fig.), 14, 15, 92, 98, 182 (plate), 183 (plate), 194, 209–26 *passim*, 254, 262–4, 272, 305, 390, 392, 398, 401, 404, 406, 408, 409, 410, 415, 418, 420, 425, 432 (plate), 437, 446, 447, 449, 450, 451, 454 (plate), 484, 676; *see also* Atolls
Barrier, Austral is., 243, 250; Cook is., 543, 549, 557, 558; Mangareva, 229, 230; Samoa, 537 (plate), 587, 654, 662, 664; Society is., 129, 140, 142, 143, 143 (plate), 159, 165, 167, 172, 179, 180, 182, 186; Tuamotu, 211
Elevated, Austral is., 238, 241; Cook is., 520, 537, 542, 546; Society is., 163, 167; Tuamotu, 220; *see also* *Makatea* (raised reef)
Fringing, Austral is., 209 (plate), 238, 241; central equatorial is., 454, 454 (plate), 455, 455 (plate), 476, 479, 481, 483, 485, 486, 488, 489, 491, 493, 496, 497, 498, 500, 501; Cook is., 520, 520 (plate), 537, 542, 543, 545, 546, 549, 560; Hawaiian is., 424, 428, 432, 445; Henderson, 92; Mangareva, 229; Marquesas, 263; Niue, 563, 564; Samoa, 537 (plate), 587, 654, 657, 658, 661, 662, 666, 667, 670, 673, 674, 675; Society is., 97, 137 (plate), 159, 163, 165, 169, 173, 179, 182, 182 (plate), 187; Tokelau, 518; Tuamotu, 183 (plate), 194, 194 (plate), 206
Sunken, 140, 142, 144, 147, 167, 229, 557
'Coral tree', *see Erythrina*
Cordia, 196, 220, 284, 490, 497, 499, 501, 509, 511; *subcordata*, 149, 207, 267, 463, 480, 491, 493, 506, 513, 554, 558, 560
Cordyline, 245, 566; *terminalis*, 267, 310; alcohol from, 257; (*ti*), 81
Cormorant, 11; flightless, 33
Cormorant bay, 44
Corn, *see* Maize
Cornwallis, H.M.S., 450
Cornwallis bay, 12
Correos, Bahía, *see* Post Office bay
Costa Rica, and Cocos island, 4, 17, 20, 21
Cotar island, *see* 'Coral' islets
Cotton, 113, 116, 121, 160, 235, 239, 274, 310, 358, 360, 567, 578, 599, 646 (table); cloth, 120, 509; *see also* Clothing; Plantations: Cotton
Councils and Committees:
Cook is., Federal Parliament, 528; Fruit Advisory Committee, 534; Island, 528, 544, 546, 548, 556; native, 528
France, Superior Colonial, 109
French Oceania (general), Administration, 109; district, 108, 110; Economic and Financial Delegations, 108, 113, 201–2; General, 109
Niue, 575
Pitcairn, Internal Committee, 87; Island, 87
Rapa, 257
Samoa (Western), of Advisers, 514; Governor's, 599; Legislative, 604, 628; *see also Fono*
Society is., district, 108; municipal, 108, 110; native, 135
Tokelau, 510, 512; village committees, 514
See also Chamber; Commissions
Courts: 88, 528, 529, 630
Cook is., High, 528; Land, 527, 529
French Oceania (general), Appeal, 111; Commercial, 111; First Instance, 111; High, 111; Land, 110; Magistrates', 110
Hawaiian is., Circuit, 356; District, 356; Federal, 356; Juvenile, 356; Land, 356; Supreme, 356; Tax Appeal, 356
Niue, 576
Pitcairn, Island, 88
Samoa (general), Land, 633, 634
Samoa (American), district, 631–2; High, 629, 631; Land, 632; village, 632
Samoa (Western), district, 631, 633; High, 630; Land, 631; village, 631
Tokelau, magistrates', 514
Tuamotu, 202
Western Pacific High Commission, 88
Cowley, Ambrose, 35
Crabs, 33, 166, 171, 208, 450, 464, 483, 500, 501, 502, 554, 556, 560, 574, 591
Craftwork, Austral is., 249; Cook is., 556; Marquesas, 272, 283; Niue, 578–9; Pitcairn, 89; Samoa, 611, 616, 626, 645 (plate), 651, 653; Society is., 185; Tokelau, 515
Cranberry, 311
Cranes and derricks, 374, 392, 394 (table), 396 (table), 407

Craters, 14 (plate), 19, 22, 24, 40, 49, 50, 52, 53, 54, 65, 66–7 (fig.), 68 (fig.), 74, 75 (fig.), 137, 141, 157, 162, 172, 178, 180, 186, 227, 253, 275, 281, 285, 293, 302, 303, 414 (fig.), 415, 419 (figs.), 421, 430, 445, 585, 586, 660, 664, 666, 670
Crayfish, 16, 81, 372, 556
Credit, organization, French Oceania, 112, 125; *see also* Finance
Crescent island, *see* Temoe
Criollo, 648
Croton, 29, 47
Cuarto Coronadas, Las, 224, 225–6
Cuba, 365
Cuckoo, 33, 507
Culpepper, 24, 31, 54
Cumberland bay, 47 (plate), 59, 60, 61 (fig.), 680
Cumberland island, *see* Manuhangi
Curaçoa, H.M.S., 501, 560
Curlew, 464, 496, 567
Currency, 113, 122, 123, 132; Fanning, 480; French Oceania, 125; Hawaiian is., 381, 320, 692; Juan Fernández, 59; Samoa, 654
Currents, Austral is., 243; central equatorial is., 455, 470, 488, 486, 489; Clipperton, 15; Galápagos, 24, 25, 26 (fig.), 27 (fig.); Marquesas, 263, 264; Society is., 148, 153; Tokelau, 506; Tuamotu, 194, 221; Humboldt (Peru), 24, 25, 55
Custard apple, 81
Customs duties, *see* Taxes
Cytosperma chamissonis, 483
Czechoslovaks, 288

Dairy farming, 117, 373; produce, 381
Damien, Father, 355
Dampier, William, 13
Dampier head, 19
Dana, J. D., 497
Dancing, 272, 620–2 (with figs.)
Danger islands, *see* Pukapuka (Cook islands)
Dangerous archipelago, 192; *see also* Tuamotu archipelago
Daphne, H.M.S., 679
Daphne island, 31, 47
Darwin, Charles, 30, 31, 36
Darwin bay, 53–4, 679
Darwin's finches, 33
Date line, *see* International date line
Davies, Rev. John, 257
Davies, T. H., and Co., 337
Davis, Captain, 232, 236
Davis, Isaac, 313
Death-rate, 329, 524, 570
Deceit, point, 670
Deer, 312
De Gaulle, General Charles, 691
De la Richerie, Commandant, 121
Democratic Party, 346, 347
Democrita, Mexican gunboat, 16
Dentistry, *see* Medical services
Departments, governmental, *see* Administration; *and under* names of countries
Depopulation, 70, 72, 108, 319, 326, 508
Depths, submarine, *see* Anchorages; Submarine, depths
'Desert', 286–7, 294, 415
Deutsche Handels- und Plantagen-Gesellschaft, 597, 634
Diadème, Le, 136, 136 (plate)
Diamond head, 398, 399 (plate), 432
Diaz, Porfirio, 16
Didunculus strigirostris, 590
Diet, *see* Food
Dioscorea, *see* Yams
Disappointment islands, 96; description, 219–21
Discovery, *see* History; *and under* names of persons
Diseases, 38, 77, 83, 88, 105, 112, 268, 270, 354, 575, 605, 638; epidemic, 71, 220, 246, 257, 567, 570, 605, 638; *see also under* names of diseases
Docks, *see* Ports; floating, 394, 397 (with table)
Dogs, 32, 70, 196, 268, 312, 333, 500, 507, 522; tax, 636, 637
Dole, Sanford B., 323
Dolphin, H.M.S., 100, 558
Dolphins, 33
Dominica, *see* Hivaoa
Donald, A. B., Ltd., 274
Donkeys, 32, 43, 48, 49, 291, 374 (table), 447
Doves, 33, 567, 590, 624
Dresden, German warship, 59
Drought, central equatorial is., 471, 477, 481, 490, 493, 496, 500; Cook is., 521, 558; Marquesas, 265–6, 267, 268, 272, 296 (*see also* 'Desert'); Niue, 565–6, 579; Society is., 188; Tokelau, 506, 518
Du Beaumanoir, Port, 146, 154
Ducie island, 10, 78, 91 (fig.), 92, 680
Duck, 33, 151, 161, 464, 590
Duff, mission ship, 136, 214, 232
Duff, Mt, 209 (plate), 227
Duke of Clarence island, *see* Nukunono
Duke of Gloucester group, 225–6, 681
Duke of York island (Society is.), 156, *see* Moorea

Duke of York island (Tokelau), *see* Atafu
Dumont d'Urville, Captain J. S. C., 675, 681
Duncan, *see* Pinzón
Dunedin, H.M.S., 604
Duperrey, Captain Louis Isidore, 135, 181, 214, 680
Du Petit-Thouars, Admiral Abel, 100, 101, 105, 269
Dutroux-Bornier, merchant, 71
Dyers' moss, *see Rocella tinctoria*
Dysentery, 38, 42

Earthquakes, *see* Seismology
East Palm valley, 442
Easter island, 2, 4, 64 (plate), 65 (plate), 76 (plate), 121, 250, 252, 680; description, 64–78 (with figs.)
Eastern island, 447
Eastern Samoa, *see* Samoa, Eastern
Ebrill, Thomas, 224
L'Eclaireur, French vessel, 490
Economic and Financial Delegations (French Oceania), *see* Councils: French Oceania
Economics, 3, 691–3; Austral is., 242, 248–9; central equatorial is., 452–3, 467–75, 483, 484; Clipperton, 17; Cook is., 530–4 (with figs.), 539, 545, 549, 553, 556, 558–9; Easter, 77–8; French Oceania (general), 107, 108, 113–25 (with figs.); Galápagos, 38; Hawaiian is., 357–82, 416, 421, 425, 428–9, 433–4, 438, 440; Juan Fernández, 59–60; Mangareva, 235; Marquesas, 274; Niue, 577–9 (with fig.); Pitcairn, 89–90; Rapa, 257; Samoa, 646–54 (with tables and figs.); Society is., 150–1, 160–1, 166, 171, 177–8, 180, 185, 189; Tokelau, 515; Tuamotu, 202–4; *see also* Agriculture; Fishing; Labour; Land; Phosphate; Plantations; Trade
Ecuador, and Galápagos, 4, 22, 31, 35, 36, 37, 38, 42
Eden island, 47
Education, Austral is., 237, 248; central equatorial is., 472, 500; Cook is., 526, 529, 530, 545, 556, 559, 562; Easter, 73, 77; French Oceania (general), 112–13; Galápagos, 38; Hawaiian is., 315, 336, 340, 341, 342, 350, 351–3, 373; Juan Fernández, 59; Mangareva, 234; Marquesas, 273; Niue, 576, 577; Pitcairn, 88; Samoa, 630, 637, 639, 640, 641–3; Society is., 107, 160, 166, 177, 184; Tokelau, 514, 518; Tuamotu, 202
Edwards, Captain Edward, 223, 225, 507
Eeu, 282
Egeria, H.M.S., 496, 497, 501, 508, 683
Egg islands, 14
Egmont island, *see* Vairaatea
Eiao, 260, 262, 266, 269, 298; description, 295–7 (with figs.)
Eimeo, 156
Electricity, 177, 339, 359 (table), 378, 402, 416, 428, 437, 518, 656–7, 660
Elephantiasis, *see* Filariasis
Eliza island, *see* Hiti
Elizabeth, ship, 92
Elizabeth bay, 50
Elizabeth island, *see* Henderson island; Toau
Eliza Francis, British ship, 466, 486
Ellice islands, 3, 453 (fig.), 471, 505, 508, 509, 514
Elliot, Captain, 82
Ellis, Sir Albert F., 500
Ellis, William, 315
Embuscade, French warship, 317
Emment, whaling master, 466, 496, 499, 502
Encantados, Las Islas, 35
Enchanted Islands, *see* Encantados, Las Islas
Encounter, H.M.S., 490
Endeavour, H.M. barque, 100
Enderbury island, 4, 454, 455 (plate), 456, 459, 462 (plate), 466, 468, 469, 471, 473, 475, 499, 682; description, 497, 498 (fig.)
Enderby island, *see* Enderbury island
Endogamy, 343, 344 (fig.), 345 (fig.)
England, *see* Great Britain
English, Captain, 480, 481, 483
English harbour, 479
English language, 73, 315, 341, 342, 349, 352, 530, 556, 685; in Palmerston, 562; in Pitcairn, 84; place-names in Galápagos, 35
Enterprise, *see* Fangahina
Epicanthic fold, 131–2, 246, 270, 525, 610
Erosion, 13, 14; Easter, 65; Galápagos, 46, 52; Hawaiian is., 301, 302, 375, 413, 418, 421, 426, 427, 428, 430, 431, 435, 436, 439, 442; Marquesas, 96, 263, 274, 275, 282, 284, 287, 293, 296; Rapa, 261, 262; Samoa, 585, 586, 665, 673; Society is., 141, 143 (plate), 180, 182
Erythrina, 149, 196, 231; *monosperma*, 310
Española (Galápagos), 28, 31, 32, 33, 39, 41 (fig.), 43

Essex, U.S. frigate, 35
Essex, whaler (wrecked), 92
Essex point, 50
'Etablissements Français de l'Océanie', *see* French Establishments in Oceania
Etena (Eden), 518
Eucalyptus, 70, 375
Eugenia malaccensis, 149, 231, 310, 311
Euphorbia lorifolia, 372
Europeans, 3, 4; influence on Polynesian culture, 132, 134, 195 (plate), 234, 273, 512, 545, 556, 558, 599, 608, 634; *see also* Administration; Christianity; History; Miscegenation; Plantations: European; Traders; *and under* names of European peoples
Evepia point, 239
Ewa plain, 433
Exogamy, 343, 344 (fig.), 345 (fig.)
Exports, *see* Trade
Eye diseases, 577, 638
Eyraud, Eugène, 71

Faaa, 132, 137, 137 (plate), 139, 140, 141, 143
Faaite, 199, 222; description, 222–3
Fa'amasino (native judges), 631, 633
Faanui, bay, 182, 182 (plate), 183, 185; village, 183, 184
Faaroa, bay, 172, 173, 178; valley, 172
Fa'asaleleanga, 628 (table), 663 (fig.)
Faatautia pass, 147
Faatemu bay, 172, 173
'Factors', 337, 342, 346
Fagaloa, 610; *see also* Fangaloa
Failautusi (clerks), 514
Faipule (representatives), Samoa, 600, 628, 629, 642; Tokelau, 514; *see also Fono*
Fair American, trading vessel, 313
Fakahina, *see* Fangahina
Fakaofu, 504–16 *passim*, 518, 683; description, 505 (fig.), 516, 517 (fig.)
Fakarava, 192, 195, 198, 201, 202, 203, 204, 205, 211, 212, 681; description, 209–11 (with fig.)
Falealili, 628 (table), 634; harbour, 666, 667
Falealupo, 628 (table), 664; bay, 662
Faleata, river, 586
Falefa, 667; bay, 665, 666; river, 665
Family organization, Pitcairn, 86; Polynesian, 73, 111, 135, 197, 220, 246–7, 510, 544, 548, 556, 572, 573
Fangahina, 221, 681; description, 218–19
Fangaitua bay, 673
Fangaloa, 610; bay, 666, 667
Fangamalo, 664
Fangasa bay, 670
Fangatau, *see* Angatau
Fangataufa, 225
Fangatonga, 660
Fanning, Edmund, 465, 483, 485
Fanning island, 453, 454, 455, 456, 457, 458 (fig.), 459, 461, 462 (fig.), 464, 465, 469, 470, 471, 473, 474, 475, 477, 478, 480 (plates), 481 (plate), 482, 483, 484, 683; description, 478–81 (with fig.); district, 475, 478
Fanning Island, Ltd., 481
Fanuatapu islet, 582, 666
Faone pass, 142, 147
Fare, harbour, 161 (plate), 170; village, 170, 171
Fareara point, 144
Farearii, 186, 188
Fare-nui-atea, *see* Fare
Farerea pass, 168, 170
Fareute point, 143, 147, 154, 155
Farming, *see* Agriculture; Dairy farming; Mixed farming
Fatuhiva, 260, 262, 263, 266, 269, 272, 273, 280 (fig.), 285, 291, 293, 681; description, 281–3 (with figs.); profile, 282 (fig.)
Fatuosofia, 664
Fatuuku, 260, 262, 266; description, 284–5
Faulting, *see* Subsidence
Fauna, Austral is., 245; central equatorial is., 464, 486, 487–8, 489, 493, 500; Cocos, 12; Cook is., 522, 555, 560; Easter, 70; Galápagos, 30–34; Guadalupe, 11; Hawaiian is., 309, 312; Juan Fernández, 58, 63; Mangareva, 231; Marquesas, 267, 268; Niue, 567; Pitcairn, 81–2; Samoa, 590–1; Society is., 160, 184; Tokelau, 507; Tuamotu, 196–7, 208; *see also* Birds; Fish; *and under* names of animals
Fauna Iti, 167; Nui, 167
Fautasi (Samoan long-boat), 537 (plate), 624, 625 (plate), 656, 662, 665
Fautaua valley, 154; waterfall, 142 (plate)
Fautua (advisers), 604, 628
Feasts, 76, 200, 572, 619–20
Fei, *see Musa fehi*
Fenua Iti, *see* Takutea
Fenua Ura, 129, 189; description, 190
Fernández, Juan, explorer, 54, 58
Fernandina, 24, 50, 51 (fig.), 52

Ferns, 20, 30, 64, 177, 184, 219, 242, 267, 268, 282, 311, 463, 480, 483, 484, 538, 545, 548, 566; bird's nest, *see Asplenium nidus*; eagle, 311; filmy, 268; *pala*, 311; tree, 20, 30, 58, 64, 256, 268, 311, 538, 590; *see also Thyrsopteris elegans*
Fertilizers, 309, 381, 399 (tables), 400, 402, 405
Ficus, 267; *tinctoria*, 506; *see also* Banyan; Figs
Figs, 70, 71
Fiji, 1, 4, 116, 481, 494, 507, 529, 553, 593, 596, 599, 609, 613, 625, 626, 639, 649, 653 (table), 656
Filariasis, 112, 515, 577, 591, 638
Filipinos, Hawaiian is., 320, 326–47 (with figs. and tables) *passim*, 352, 366, 370 (table), 377, 378 (with table), 379, 381, 446
Filippo, reported reef, 485
Finance, Cook is., 529; French Oceania, 108, 109, 112, 125; Hawaiian is., 349, 351; Niue, 576, 577; Pitcairn, 88; Samoa (American), 630, 637, 641; Samoa (Western), 602, 604, 636–7, 640; *see also* Taxes
Finches, 33, 34, 184
Finger point, 41
Fire-walking, 177
Firs, 312, 313, 314
Fish, 16, 17, 20, 24, 64, 76 (plate), 81, 89, 132, 154, 171, 197, 211, 220, 238, 239, 245, 252, 292, 381 (table), 444, 446, 464, 483, 486, 490, 491, 499, 500, 501, 502, 518, 546, 549, 553, 554, 556, 560, 561, 562, 567, 574, 611, 612, 619 (with fig.), 661; canning, *see* Canneries; poisonous, 135, 203, 224, 499; salting, 490; tinned, 653; *see also* 'Bacalao'
Fishing, 48, 91, 108, 161, 165, 171, 180, 186, 189, 221, 224, 227, 233, 235, 247, 257, 258, 259, 272, 285, 298, 333, 334, 406, 515, 530, 539, 544, 556, 558, 559, 560, 561, 610, 675; commercial, 17, 38, 43, 59–60, 357, 359, 371 (plate), 376–7, 393, 397, 446, 676; communal fish drives, 133, 249; methods, 74, 76, 84, 85, 89, 109 (plate), 134–5, 163, 185, 199–200 (with figs.), 203, 249, 512, 541 (fig.), 545, 553, 574, 624–5; ponds and weir traps, 133 (fig.), 134, 135, 164 (fig.), 165, 181 (fig.), 199–200 (with fig.), 203, 229 (fig.), 235, 398, 421, 425, 624; *see also* Canoes; Pearls and pearl shell
Fitafita guard, 608, 652
Fitiuta, 675
Fito, peak, 665
FitzRoy, Captain Robert, 36, 223, 679
'Flame-tree', *see Erythrina*
Flamingo, 33
Flint island, 452, 454, 456, 460, 466, 469, 470, 471, 473, 475, 485, 490, 683; description, 489 (fig.), 490–1
Flora, *see* Vegetation
Floreana, 24, 30, 31, 32, 33, 35, 36, 37, 38, 39, 41 (fig.), 43–4
Fly, H.M.S., 82, 86
Flycatcher, 33, 81
Flying Fish, U.S.S., 497
Fog, 10, 25, 58, 80, 256
Folger, Mayhew, 82
Fono, of *Faipule*, 600, 604, 628, 639; *Fono* (council), 612–3, 616; *Tele* ('Great Council'), 629, 630; (mission council), 644; *see also* Rank (Polynesian), Samoa
Food, 215, 340, 357, 373, 374, 375, 382, 518, 615, 619–20; imported, 117, 120, 381, 531, 534, 539, 566, 611–12, 612, 652, 692; locally produced, 86, 311, 333, 506, 512, 513, 515, 518, 538, 551, 553, 556, 557, 561, 565, 577, 611–12, 634, 643, 693; *see also* Birds; Fish; Meat; *and under* names of food crops
Forastero, 648
Ford island, 433
Forest, 19, 21, 27–8, 29–30, 46, 48, 50, 60, 62, 64, 266, 268, 312, 333, 360 (with fig.), 361 (fig.), 362 (fig.), 363 (fig.), 364 (fig.), 375, 413, 424, 483, 587 (plate), 675; products, 118; *see also* Timber
Forestry, 375
Forts, 314; Polynesian, 257, 262 (plate), 575
Four Crowns, *see* Actaeon group
Fowls, *see* Poultry
Framboesia, 515, 545, 577, 638
France: 71, 313, 317, 323, 490, 592, 691
Administration, in Eastern Pacific, Clipperton, 17; French Oceania, 95, 108–12, 121, 173
Naval activity, 258, 316, 318; *see also* names of ships
'Service Geographique', 680
'Service Hydrographique de la Marine', 194, 678–84 *passim*
Sovereignty, in Eastern Pacific, Austral is., 104, 247, 252; Clipperton, 13, 16; Mangareva, 104; Marquesas, 105, 317; Rapa, 104, 256; Society is., 100–1, 103, 171, 184, 317; Tuamotu, 104, 192

France (*cont.*): Trade, central equatorial is., 471; Easter, 71; French Oceania, 114, 115, 116, 118, 120, 123, 124 (fig.), 178, 208; Hawaiian is., 316
Treaties, 100, 103, 316
See also French
Francés, Puerto, 61
Franchize, political, 317, 319, 343, 349
Frangipani, 212
French, Catholics, *see* Roman Catholic church and missions; culture, in French Oceania, 107; language, 685; official names, 226, 236; Protestants, *see* Protestant churches and missions; settlers, 37, 150, 160, 245; traders, 518
French Establishments in Oceania, 3, 4, 17, 519, 691, 692, 693; general description, 95–128 (with figs. and plates); individual groups and islands, 129–299 (with figs. and plates)
French Frigate shoal, 300 (fig.), 301 (fig.); description, 444
French Oceania, *see* French Establishments in Oceania
Freshwater bay, 40, 41, 42
Freycinet, Louis de, 675
Freycinetia, 587 (plate)
Friedlander, 661
Frigate birds, 16, 81, 185, 245, 285, 297, 312, 444, 446, 464, 496, 567, 676; in sculpture, 76
Frogs, 312
Fruit, 20, 29, 52, 60, 132, 154, 164, 171, 189, 235, 242, 292, 374, 375, 380, 433, 495, 529, 530, 531, 534, 539, 551, 649, 692; *see also* Citrus fruits; *and under* names
Fuel, oil, 381, 390, 393; facilities, 153–4, 393, 401, 402, 403 (fig.), 404, 405, 406, 407, 411, 481, 527, 656, 660; *see also* Coal; Oils, mineral; Petroleum products
Funafuti, 508
Furneaux island, *see* Marutea, North
Furniture making, 375, 491
Fusi, 667
Futuna (Hoorn islands), 1, 3, 507

Galápagos, 2, 4, 10; description, 14 (plate), 15 (plate), 22–54 (with figs.), 32 (plates), 33 (plates), 46 (plates)
Galápagos albatross, 33; finch, 33, 34; hawk, 31; penguin, 33; sea lion, 33
Gambia, Hawaiian ship, 444
'Gambier administration', 108, 201, 202, 214, 232, 234
Gambier islands ('Iles Gambier'), *see* Mangareva
Gambusia, 555, 562
Ganges, Nantucket whaler, 466, 501
Gannet, H.M.S., 683
Gannets, *see* Booby gannets
Gardenia, 207, 245, 566; *G. taitensis*, 506
Gardner bay, 43
Gardner island (Galápagos), 43
Gardner island (Hawaiian is.), 300 (fig.), 301 (fig.); description, 444, 445 (with fig.)
Gardner island (Phoenix islands), 454, 455, 460, 463, 466, 470, 472, 473, 501, 683; description, 498 (fig.), 500–1
Gardner pinnacle, 444
'Garúa', mist, 25, 29; region, 27; season, 15 (plate), 25, 26 (fig.)
Gases, 304; acetylene, 370; argon, 303; carbon dioxide, 303; monoxide, 303; chlorine, 303; ethylene, 370, 534; hydrogen, 303; nitrogen, 303
'Gassing', of pineapples, 369–70; of oranges, 534
Gayangos, Don Thomas, 252
Gedney, U.S.S., 679
Genovesa, 31, 53 (fig.), 54
Gente Hermosa, *see* Swains island
Geology, Austral is., 236, 239, 260–2; Cook is., 542–3 (with fig.), 547 (fig.); Galápagos, 22–4, 32; Hawaiian is., 304, 436; Line is., 475–6; Niue, 563–4; Samoa, 583–6 (with figs.); Society is., 129, 137–9, 140, 141, 162–3, 178; *see also* Coral reefs; Island types; Rocks; Vulcanism
George IV, 316
German, 37, 73, 314; planters, 569, 647; scientists, 661; settlers, 634, 652, 662
Germany, 323, 591; and Samoa, 322, 591–600 *passim*, 627, 630, 636, 638, 641, 644, 646, 647, 648; naval activities, 71–2, 322, 597, 692; trade, 115, 118, 653 (table), 692; treaties, 596, 631; *see also* German
Gibson, Captain, 501, 560
Gibson, Walter Murray, 322
Gideon Howland, American whaler, 493
Gil, Señor, 37, 38
Gilbert and Ellice Islands Colony, 4, 471, 472, 473, 475, 478, 480, 483, 496, 497, 499, 500, 501, 502, 508, 512, 518
Gilbert islands, 322, 334, 472, 509; islanders, 483, 499, 500, 501
Ginger, 81
Girdles, ceremonial, Society is., red, 100; yellow, 100, 184
Glasgow, H.M.S., 59
Gleichenia, 311, 544; *linearis*, 149, 267
Glottal closure (glottal stop), 9, 73, 132, 234, 270, 525, 610, 688–9

Gloucester island, 216
Gneisenau, German warship, 151, 182
Goat island, 659 (fig.)
Goats, 11, 20, 28, 29, 43, 44, 47, 48, 58, 60, 64, 82, 87, 117, 164, 235, 258, 274, 282, 487, 522
Goat's-foot convolvulus, *see Ipomoea pes-caprae*
Godeffroy, Johann Cesar, und Sohn, 593, 594, 597, 602, 606, 647, 676
Gods, *see* Polynesian: Religion (ancient)
Gold, 241
Goldfinch, H.M.S., 683
Gonsalez, Felipe, 70
González, Islota, 55
Good Hope, American vessel, 555
Good Hope island, *see* Rekareka
Gourds, 245, 248, 252, 310
Government, *see* Administration
Governments, native, 101–4 *passim*, 313–23 *passim*, 596, 597, 600; *see also* Kamehameha; Pomare; Rank (Polynesian)
Graham, Bennett, pirate, 20
Grampus rock, 658
Grand Duke Alexander island, *see* Rakahanga
Grand Récif, 14
Grande, Puerto, 24, 41, 42, 679
Grapefruit, 531
Grasses, 13, 16, 30, 33 (plate), 44, 46, 58, 64 (plate), 69, 81, 228, 246, 247, 256, 266, 269, 278, 284, 285, 297, 298, 309, 311, 375, 430, 440, 442, 444, 446, 447, 477, 487, 676; as thatch, 246, 258; *see also Lepturus*; *Miscanthus*
Grayson's cove, 12
Great Britain: 6, 35, 71, 132, 165, 317; and Hawaiian is., 313, 316, 317, 323; and Pitcairn, 78, 82, 83; and Samoa, 592–9 *passim*; and Society is., 100–1, 103, 121, 184
 Admiralty, 6, 678–84 *passim*
 Colonial Office, 499
 Naval activity, 86, 90, 318, 323, 475, 597; *see also under* names of ships
 Sovereignty, central equatorial is. (general), 453; Cook is., 523, 528, 558, 560, 561, 562; Line is., 475, 483, 486, 488, 490; Niue, 562, 568, 569; Phoenix is., 497, 499, 500, 501, 502; Tokelau, 504, 508; *see also* Concessions; Gilbert and Ellice Islands Colony; High Commissioner for the Western Pacific
 Trade, 17, 118, 208, 380, 471, 579, 653 (table), 654 (fig.), 692
 Treaties, 103, 596, 598
 See also British; English language
Green island (Kure), 449
Gregg, David L., 318
Greig, William, 480, 483
Greig island, *see* Niau
Grice Sumner and Co., 468, 487
Guadalupe, 3, 10–11, 679; elephant seal, *see* Seal
Guam, 323, 389, 682
'Guano, American', 467–8; *see also* Companies; Phosphate
'Guano Act', 468, 504
Guasaballena, Punta, *see* Hueso Ballena, Punta
Guava, 20, 40, 81, 149, 150, 177, 245, 267, 268, 311, 483, 538, 548, 567
Guayaquil, 38, 39
Gulls, 33
Gunnera, 63, 64

Haahameru pass, 216
Haapiti, Port, 159; village, 160, 161
Haapuu bay, 170
Haatuatua, bay, 288
Haavai bay, 170
Haave, anchorage, 294; bay, 264; valley, 293
Ha'avei, *see* Haave
Haena, 437
Hagemeister, mariner, 212
Hagemeister island, *see* Apataki
Haiku, 422
Hakaehu, bay, 288
Hakahau, valley, 291; village, 292
Hakahetau, valley, 291 (fig.), 292; bay, 292; village, 292
Hakamaii, bay, 292
Hakapa, 288
Hakatao, bay, 292
Hakatea, cove, 288
Hakaui, settlement, 288; valley, 266, 286
Hakupu, 577
Halapepe, *see Cordyline*
Halawa, cape, 408; bay, 425; valley, 424
Haleakala, mount, 302, 418, 420, 421, 422
Haleakala, S.S., 383
Haleiwa, 389
Halemaumau, crater, 303, 303 (plates)
Hamelin, Admiral, 115
Hamene bay, 179
Hamoa, 422
Hana, 386, 392, 409, 418, 420, 421, 422
Hanaiapa, bay, 264, 278; settlement, 275, 278; valley, 276
Hanalei bay, 410, 410 (plate), 438; river, 435

Hanamanioa, 421
Hanamaulu bay, 386, 410, 436; river, 437
Hanamenu, bay, 264, 276, 278
Hanapaoa valley, 276
Hanapepe bay, 390, 404–5, 437; settlement, 438
Hanatekua, bay, 278
Hanavave, bay, 281, 282, 283 (fig.)
Hane, 293; anchorage, 295; valley, 293, 294; village, 295
Hanga Piko, 65 (plate), 67, 78
Hanga Roa, 67, 71, 77, 78; settlement, 66 (fig.), 69, 70, 71, 72, 73
Hao, 192, 194, 195, 198, 199, 204, 216, 223, 681; description, 216, 217 (fig.)
Haole, see 'Other Caucasians'
Hapateki, bay, 292
Hapatoni, bay, 280
Haraiki, 218
Harbours, *see* Ports and harbours
Harpe, Ile la, *see* Hao
Hartford, U.S.S., 490
Hatiheu, 288
Hatutu, 260, 262, 266, 298; description, 295 (fig.), 297–8
Hau (hibiscus), *see Hibiscus tiliaceus*
Hau (tree), *see Triumfetta semitriloba*
Hauti, 242
Hawaii, island of, 300 (fig.), 301 (with fig.), 303 (plates), 304 (plate), 305 (plate), 305, 306, 308, 309, 312, 324, 348, 356, 358 (fig.), 359 (table), 360 (fig.), 366, 369, 370, 371, 372, 374, 384 (fig.), 386, 389, 391, 399 (plate), 400, 403, 406, 407, 585, 682; description, 413–17 (with fig. 414 and plates)
Hawaii, S.S., 383
Hawaii, Territory of, 300; *see also* Hawaiian islands
Hawaii Consolidated Railway, 417
Hawaiian Fisheries Company, 377
Hawaiian islands, 2, 3, 4, 76, 99, 120, 233, 248, 271, 453, 472, 484, 594, 597, 599, 612, 626, 678, 682; description, 300–451 (with figs.), 303 (plates), 304 (plates), 305 (plates), 370 (plates), 371 (plates), 382 (plates), 383 (plates), 392 (fig.), 398 (plates), 399 (plates), 404 (plates), 405 (plates), 410 (plates), 411 (plates), 432 (plates), 433 (plates), 691, 692
Hawaiian, language, 315, 333; literature, 352
'Hawaiian mahogany', see *Acacia koa*
Hawaiian Sugar Planters Association, 375, 382, 495
Hawaiians, 326, 327 (and table), 328 (fig.), 329 (with table), 332, 334, 335 (with table), 338, 340, 341 (table), 343 (with table), 344 (fig.), 345 (fig.), 346, 349, 350 (table), 352, 354, 355, 356, 359, 370 (table), 372, 373, 376, 378 (table), 398, 425, 428, 472, 493, 497
Hawi, 417
Hayes, W. H. ('Bully'), 568
Health, 77, 88, 220, 354–5; *see also* Diseases; Medical services
Heani, Mt, 275
Heiau, see Temples, Polynesian
Heliotrope, 309; *Heliotropium anomalum*, 477, 480
Hemeni, 294, 295
Henderson and Macfarlane, 561
Henderson island, 10, 78, 89, 91 (fig.), 92, 680
Henua ataha, see 'Desert'
Hercules, ship, 92
Hereheretue, 681; description, 216
Hergest rock, *see* Motu Iti (Marquesas)
Hernandia ovigera, 149, 506, 513, 548, 566
Herons, 33, 184, 208, 231, 245, 268
Hervey, Captain (Lord Bristol), 549
Hervey island, *see* Manuae
Hervey islands, *see* Au o Tu, Te; Manuae
Hevea, see Rubber
Hibiscus, 98, 149, 183, 196, 207, 208, 231, 242, 245, 267, 284, 310, 480, 483, 538, 548, 566, 626; *H. tiliaceus*, 309
Hides, 38, 77, 380, 381 (table), 654 (fig.)
High Commissioner for the Western Pacific, 4, 78, 86, 87, 88, 485, 596
High island, *see* Raivavae
Hikeu bight, 292
Hikueru, 218
Hikurangi, 535, 536, 536 (plate), 540 (fig.)
Hilo, 304, 305 (plate), 306, 371 (plate), 384 (fig.), 386, 390, 392, 399 (plate), 400 (with fig.), 401, 402, 415, 416, 417; population, 325, 339, 354
Hilo Railway, 383, 417
Hippomane Manzanilla, 29
Hiro, launch, 155
Hiro, Mt, 250
Hiro (Polynesian voyager), 99
History, Austral is., 242, 245; central equatorial is. (general), 464–74 (with figs.), 493; Clipperton, 13, 16–17; Cocos, 20; Cook is., 522–3, 525, 528, 537, 538, 544, 548, 549, 552, 553, 555–6, 558, 560, 561, 562; Easter, 70–2; French Oceania (general), 98–100,

100-5, 120-3; Galápagos, 35-7; Hawaiian is., 300, 312–23, 334, 335, 336, 337, 338, 346, 351, 354, 359, 365, 361, 377, 389, 397–9, 444, 446, 449, 450–51; Juan Fernández, 58–9; Line is., 475–91 *passim*; Mangareva, 232, 236; Marquesas, 104–5, 280; Niue, 567–9; Phoenix is., 494, 502 *passim*; Pitcairn, 82–3; Samoa, 591–604, 675; Society is., 145, 160, 170–1, 177, 179, 184; Tokelau, 507–8; Tuamotu, 198, 223; *see also* names of persons
Hiti, 222
Hitiaa, 138, 143, 144; Port, 147
Hivaoa, 98, 260, 262, 264, 266, 267, 269, 271, 272, 273, 285, 286, 291, 302 (plate), 681; description, 275–8 (with figs.)
Hoahakananaia, statue, 76 (plate)
Hokatu, valley, 293, 294; village, 295
Holt island, *see* Taenga
Homestead (Molokai), 386
'Homesteading' (Hawaiian is.), 338, 340, 346, 355–6, 360 (fig.), 361 (fig.), 362 (fig.), 363 (fig.), 364 (fig.), 370, 421, 425
Honey, 481
Hong Kong, 652
Honokaa, 417
Honokohau, 386
Honolulu, 2, 3, 4, 155, 346, 348, 349, 355, 356, 375, 377, 378, 379, 384, 386, 430, 432, 496; city, 393 (fig.), 397–8, 398 (plate), 399 (plate), 441, 484; climate, 306–8 (with fig.); communications, 354, 383, 389, 401, 417, 425, 429, 434, 435, 438, 449, 481, 516, 660; history, 314, 315, 317, 351, 468, 470; population, 325, 336, 338, 339, 341, 347, 434; port, 314, 354, 389, 390, 392–400 (with figs. and tables), 398 (plate), 433; trade, 359, 367, 377, 378, 381, 383 (plate), 399 (tables), 400, 406, 408, 410, 422
Honolulu Ironworks, 377, 397
Honuake, *see* Pukapuka (Tuamotu)
Honuapo, 407, 416, 417
Hood island (Galápagos), *see* Española
Hood island (Marquesas), *see* Fatuuku
Hookworm, 545, 638, 640
Hoolehua, 426
Hoopuloa, 304, 415
Hooumi, 288
Horn, cape, 351
Horses, 32, 42, 48, 70, 77, 78, 117, 184, 185, 209, 235, 239, 242, 250, 258, 265, 312, 373, 374, 440, 647, 651, 662, 664, 669
Hospitals, 354, 355, 378, 402; *see also* Health; Medical services
Houlder Bros., 469, 683
Housing, Austral is., 242, 246; Cook is., 521 (plate), 531, 552, 559; Easter, 71, 73; Galápagos, 37; Hawaiian is., 339, 340, 378, 398 (plate); Juan Fernández, 59; Marquesas, 273; Niue, 568, 571; Pitcairn, 85; Samoa, 610–11, 611 (plate), 638, 657; Society is., 133–4; Tokelau, 509, 517 (fig.); Tuamotu, 194 (plate), 198–9, 212, 215, 219, 220
Howland island, 2, 452, 454, 455, 455 (plate), 457, 459, 460, 464, 466, 468, 469, 471, 472, 473, 474, 475, 477, 683; description, 492 (fig.), 493–4
Huahine (Society islands), 102, 103, 129, 133, 161 (plate), 178, 522, 680; description, 161–71 (with figs.); Huahine Iti, 167, 171; Huahine Nui, 167, 171
Huahine (Tubuai), 250
Hualalai, mount, 413, 414
Hualalai, S.S., 383
Hudson, Captain, 518
Hübner, bay, 670
Hueso Ballena, Punta, 61
Huleia river, 405, 437
Hull island (Austral islands), *see* Maria (Austral islands)
Hull island (Phoenix islands), 454, 455, 460, 464, 466, 470, 471, 472, 473, 475, 501, 682; description, 498 (fig.), 499–500
Human sacrifice, 105, 135, 136, 200
Humboldt current, *see* Currents
Humidity, *see* Climate
Humming birds, 58
Humphrey's island, *see* Manihiki
Humuula, S.S., 383
Hurepiti bay, 179
Hurricanes, central equatorial is., 490; Cook is., 520, 529, 531, 538, 545, 551, 554, 556, 558, 561; French Oceania, 97, 98, 130, 183, 196, 207, 211–18 *passim*, 223, 237, 256, 264; Niue, 565; Pitcairn, 80; Samoa, 588, 597, 648, 655; Tokelau, 506, 516, 517
Hutu, *see Barringtonia*
Hutuiti bay, 66, 67, 78, 680

Iao valley, 420
Ice, *see* Refrigeration
Icelanders, 37
Iguana, land, 32; marine, 30, 31–2, 32 (plate)
Iguana cove, 50
Ikitake, 216

Ilabaca channel, 47
'Ile du Solide', *see* Uahuka
'Iles de Corail', see 'Coral' islets
'Iles de Sable', *see* 'Coral' islets
'Iles du Vent', 129; *see also* Society islands: Windward group
'Iles Egg', *see* Egg islands
'Iles sous le Vent', 129; *see also* Society islands: Leeward group
'Iles Tubuaï', 236; *see also* Austral islands
Ilima, 310
Ilio point, 424
Imports, *see* Trade
Indefatigable island, *see* Santa Cruz
India, 314, 381, 653 (table)
Indians, South American, 33 (plate), 58; *see also* Labour, American Indian
Indigo, 310
Indo-China, Bank of, 125
Indo-Chinese, 106, 107, 118, 208
Industries, 113, 178, 353, 357, 359, 377, 433, 434, 651
Infanticide, 333
Influenza, 605, 638
Inglés, Puerto, *see* Oeste, Bahía
Ingraham, mariner, 104
Inner harbour (Midway), 447, 448 (fig.)
Inocarpus edulis, 149, 245, 267, 538, 544, 548, 566
Inocentes, Los, 63, 64
Insects, 13, 63, 70, 82, 464, 499, 500, 502, 507, 560, 567, 591; pest control, 365, 371, 375, 495–6, 555; *see also* Mosquitoes
Instructions Nautiques, 6, 222
Inter-Island Airways, 389, 434, 438
Inter-Island Steam Navigation Co., 383, 394 (table), 397, 399, 425, 438
Intermarriage, *see* Miscegenation
International Court (The Hague), 16
International date line, 1
Investments, 335–6, 337, 338, 357, 359 (with table), 376, 381, 383; investment trusts, 381
Ipomoea pes-caprae, 149, 245, 267
Ireland, mariner, 223
Iriru pass, 173
Iron, 399 (tables), 653 (imports)
Ironwood, *see* Casuarina
Iroquois, U.S.S., 682
Irrigation, 545; Hawaiian is., 308, 358, 359, 365, 366, 369, 372, 433
Isabela, 14 (plate), 15 (plate), 24, 30, 31, 32, 33, 35, 37, 38, 39, 46, 49–52, 51 (fig.)
Isabella, New Bedford whaler, 493
Isla, *see under* proper names
Isla, Punta, 61
Island types:
 Coral, central equatorial is., 454–55, 475–502 *passim*; Clipperton, 14; Cook is., 520, 551, 560; Ducie, 92; French Oceania (general), 96; Hawaiian is., 300 (with fig.), 301, 432 (plate), 441, 444, 445–51; Niue, 563; Oeno, 91; Samoa, 675; Society is., 143; Temoe, 236; Tokelau, 504; Tuamotu, 192–226 *passim*; *see also* Atolls
 Diversity, 2–4
 Elevated coral, Henderson, 92; Tuamotu, 205
 High, 3, 96–8, 129; *see also* Volcanic *below*
 Low, 3, 96–8, 441; *see also* Coral
 Volcanic, 504; Austral is., 236, 238, 239, 243; Clipperton, 14; Cocos, 18; Cook is., 519, 535, 542, 545, 546, 549; French Oceania (general), 96; Galápagos, 22, 24; Guadalupe, 10; Hawaiian is., 300 (with fig.), 301, 413–41, 433 (plates), 442, 444; Juan Fernández, 55, 56; Malpelo, 21; Mangareva, 227; Marquesas, 260; Pitcairn, 79; Samoa, 585, 660, 664, 665, 666, 670, 673, 674; San Felix and San Ambrosio, 54; Society is., 129, 137, 156, 165, 172, 178, 180, 186
Isleways, Ltd., 383
Islota González, *see* González, Islota
Isotherms, 25, 26 (fig.), 27 (fig.)
Italians, 72
Italy, 13, 16, 679; *see also* Italians
Itasca, U.S. coastguard cutter, 494, 683
Itascatown, 493
Itu Anoama'a, 628 (table)
Ivaiva bay, 280
Ivirua, 544
Iwilei, 377, 393, 398, 398 (plate)

Jaluit, 598, 600
James bay, 49
James island, *see* San Salvador
Japan, 132, 318, 366, 691, 692; and Hawaiian is., 321, 323, 342, 352–3; trade, 120, 123 (with fig.), 208, 371, 380, 653, 692; *see also* Japanese
Japanese, French Oceania, 106, 107, 208; Hawaiian is., 320, 321, 326–47, *passim* (with figs. and tables), 349, 350 (table), 352, 354, 357, 366, 370 (table), 371, 375, 376, 378 (with table), 379, 440, 444, 691

Jarvis island, 2, 454 (with fig.), 455, 456, 459, 460, 462 (fig.), 466, 467, 468, 469, 472, 473, 475, 683; description, 485–6, 492 (fig.)
Jefe Territorial, 37, 38, 52
Jennings, Eli, 518
Jervis island, *see* Rabida
Jetties and piers, Austral is., 243, 250; central equatorial is., 456, 476, 479, 480 (plates), 486, 494; Cook is., 540 (fig.), 541, 550, 561; Easter, 65 (plate), 67; Hawaiian is., 390, 397, 408, 409, 416, 425, 440; Mangareva, 230; Niue, 564; Rapa, 256; Samoa, 654, 658, 662, 667, 670; Society is., 145, 159, 165, 170, 176, 182 (plate), 182–3, 187; Tokelau, 517, 518; Tuamotu, 195, 207, 208 (plate), 210, 212, 219, 221, 223
Jiggers, 34
John Williams, mission vessel, 507, 556, 684
Johnston, Captain, 450
Johnston island, 4, 300 (fig.), 442, 682; description, 449–51
Jones-Costigan Act, 365
Juan Fernández, explorer, *see* Fernández, Juan
Juan Fernández group, 2, 4, 10, 54, 680; description, 55–64 (with figs.)
Juan Fernández island, 55; *see also* Más-á-tierra
Juania australis, 60
Judd, Dr Gerrit P., 317
Judiciary, *see* Courts
Junco, El, 40
Jupiter, Spanish barque, 252
Justice, *see* Courts; Law
Jute, 399 (tables), 693

Kaahumanu, 315
Kaako, Mt, 431
Kaanapali, 409, 421
Kaava ridge, 276
Kaawa loa, 417
Kaea, cape, 410, 428
Kaena point (Lanai), 427, 428
Kaena point (Oahu), 383 (plate), 411 (plate), 432, 433
Kaenae valley, 420; village, 422
Kafika, 566
Kahana, 435
Kahoolawe, 300 (fig.), 301, 306, 324, 348, 358 (fig.), 427 (fig.), 429–30; description, 429–30 (fig. 427)
Kahuku, 386, 387 (fig.), 432, 434, 435
Kahului, 390, 392, 402–4 (with fig.), 420, 421, 422
Kailua, 315, 417; bay, 406, 416
Kaimiloa, Hawaiian ship, 322
Kainga, Te, islet, 554
Kakaako, 393, 398
Kaki pass, 216
Kalae point, 417
Kalakaua, David, King, 321, 322
Kalaupapa, 304 (plate), 355, 386, 423 (fig.), 426
Kalawao, 348
Kalihi, 355; entrance, 398, 398 (plate)
Kalihiwai bay, 437
Kalihi channel, 426
Kamahio bay, 429
Kamaiki point, 428
Kamaini, 311
Kamakaiwi Field, 494
Kamakau, 425
Kamalo harbour, 408, 425
Kameeiamoku, 313
Kamehameha, I, 312, 313, 314, 316, 318, 373; II, 315, 316, 421; III, 316, 317, 318, 335; IV, 318; V, 319
Kanaloa (god), 333
Kanapau bay, 429
Kanawha, U.S.S., 679
Kane (god), 333
Kaneohe bay, 432, 432 (plate), 435
Kanito, *see* Adventists
Kapaa river, 437; settlement, 437, 438
Kapaia river, 437
Kapalama basin, 383 (plate), 392, 393, 398, 398 (plate); channel, 393, 398, 398 (plate)
Kapok, 183, 567
Karika, traditional chief, 539
Karlshoff island, *see* Aratika
Katiu, 195, 222; description, 222
Kau desert, 415
Kauai, 300 (fig.), 301 (with fig.), 302, 305, 308, 309, 312, 314, 315, 324, 348, 356, 358 (with fig.), 359 (table), 364 (fig.), 366, 370 (plate), 371, 372, 386, 388 (fig.), 389, 390, 404, 405, 405 (plates), 406, 410, 410 (plate), 418, 682; airport, 438; description, 435–8 (with fig. and plates)
Kauehi, 195, 211, 223, 681; description, 223
Kauiki head, 409
Kauila, 310
Kaukura, 197, 200, 204, 213; description, 212
Kaula, 300, 301 (fig.), 430; description, 441 (with fig.)
Kaumalapau, 410, 428, 429; harbour, 410 (plate)
Kaumualii, 314

Kaunakakai, 408, 425
Kaupo, 421, 422; gap, 302
Kava ceremony, 566, 611 (plate), 612, 616, 617–9 (with fig.); *see also Piper methysticum*
Kawai point, 405
Kawaihae, 406
Kawaihoa, 439
Kawaikini peak, 435
Keaau, 417
Kealia, 437; river, 437
Kealaikahiki point, 429
Kealakekua bay, 303, 334, 406, 416
Keehi lagoon, 398 (plate)
Kekaa head, 410
Keokea point, 400
Keoneoio, 421, 422
Kerguelen, Lieut. Coet de, 16
Kermadec islands, 1
Kewalo basin, 376, 392 (fig.), 393 (with fig.), 397
Khandeish, ship (wrecked), 91
Ki, see Cordyline, terminalis
Kicker rock, 41
Kihei, 422
Kii, 440
Kikoa point, 428
Kilauea (Hawaii), 302, 384 (fig.), 413, 415, 417
Kilauea (Kauai), 438
Kilauea, S.S., 383
Kilohana, 436
Kimiangatau, 546
King George islands, 211–12
King George III's island, 100; *see also* Tahiti
King island, *see* Taiaro
Kingfisher, 184
Kingman reef, 472, 475; description, 484–5
'Kings', of Hawaii, *see* Kamehameha; of Niue, 573; of Mangareva, 233, 235; of Samoa, 596, 600, 613; of Tubuai, 247
Kingsford Smith, Sir Charles, 494
Kingship groups, *see* Family organization; Polynesian: Culture
Kipahulu, 422
Koa, see Acacia koa
Koele, 428, 429
Kohala, 586; range, 301, 407, 413, 415, 417
Koko, crater, 431; head, 431
Kolakola, 440
Kolo harbour, 408, 425
Kona district, 370, 372, 415, 416, 417
Kona storms, 305, 306, 307 (fig.), 390, 404, 406, 407, 408, 409, 410, 421, 425, 429, 442
Kondor, German warship, 684
Koolau gap (Maui), 302, 420
Koolau range (Oahu), 369, 431, 432
Koreans, Hawaiian is., 320, 321, 326–47 (with figs. and tables) *passim*, 366, 370 (table)
Kotzebue, Captain Otto von, 70, 189, 211, 213, 218, 675
Ku (god), 333
Kuhina nui, 315
Kuhio bay, 401
Kukui, see Aleurites moluccana
Kukui point, 405
Kukuihaele, 416, 417
Kumukahi, cape, 400, 415
Kurateke, *see* Vanavana
Kure, 300 (with fig.), 301 (with fig.); description, 449

Laau point, 408, 424
Labour:
General, 16, 17, 117, 165, 166, 186, 190, 216, 224, 235, 269, 487, 535, 546, 652, 692; (Hawaiian is.), 319, 320, 325, 326, 330, 336–8, 353, 357, 365, 366 (with table), 367, 382, 392, 429
American Indian, 38, 42
Chinese, 107, 118, 121, 208, 320, 321, 349, 352, 371, 606, 607, 631, 647, 652
Filipino, 320, 321, 329, 339, 343, 352, 377, 379
Indo-Chinese, 107, 118, 208; Japanese, 208, 320, 321, 349, 352, 376, 379; Korean, 320
Melanesian, 606–7, 647, 652
Polynesian, central equatorial is., 469, 477, 478, 480, 483, 487, 488, 490, 491, 493, 501, 502; Cook is., 539, 545, 560; Easter, 74; Hawaiian is., 314, 373, 376; Marquesas, 297; Niue, 568, 577; Peru, 71; Samoa, 593–4, 652, 653; Society is., 71, 132; Tokelau, 515, 518; Tuamotu, 208
Porto-Rican, 320; Portuguese, 320; Spanish, 320
Conditions, 74, 118, 321, 340, 355, 369, 370, 376, 378–80, 568
Organizations, 379–80, 341
See also Labour traffic
Labour traffic, 70–1, 257, 507, 508, 516, 523, 552, 558, 568
Laburnum, H.M.S., 684
Lady Penrhyn, British ship, 552
Lagoon island, *see* Tematangi
Lagoons, Austral is., 238–9, 244 (fig.), 249, 251 (fig.); central equatorial is., 454, 480 (plate), 463, 475, 476, 479,

486, 487, 488, 489 (fig.), 491, 496, 497, 501; Clipperton, 15–16; Cook is., 549, 551, 558; French Oceania (general), 98; Galápagos, 46; Hawaiian is., 433; Mangareva, 118, 235; Marquesas, 276, 287; Rapa, 252; Samoa, 587, 666, 676; Society is., 135, 137 (plate), 140, 143, 143 (plate), 165, 167, 182, 185, 186, 188, 190; Tuamotu, 118, 194 (plate), 206; brackish, 15, 211, 454; fresh water, 276, 287, 496; *see also* Atolls
Lahaina, 385 (fig.), 389, 390, 404 (plate), 409, 420 (with fig.), 421, 422
Laie, 435
Lakes, Cocos, 19; Cook is., 542, 548; Easter, 65, 69; Galápagos, 24, 40, 47 (crater lakes absent, Santa Cruz), 49; Line is., 454, 476, 477, 481, 491; Marquesas, 267; Samoa, 586, 661, 666; Society is., 135, 141–2, 159, 161, 167, 170
Lamont, trader, 552
Lanai, 76, 300 (fig.), 301, 324, 348, 358 (fig.), 362 (fig.), 369, 383, 389, 410, 682; City, 428, 429; description, 426–8 (with fig.); ranch, 428
Lanciers, l'Ile des, *see* Akiaki
Land:
Alienation and claims, 71, 111, 125, 225, 335, 592, 593, 595, 596, 598, 605, 631, 632, 633–5 (with fig.), 646
Policy, 111, 576, 633–6 (with fig.)
Tenure, central equatorial is., 471–2; Cook is., 526–7, 529, 544, 548, 553, 556, 558; Easter, 73; French Oceania, 99, 111, 135, 197, 219, 220, 247, 271, 273–4; Hawaiian is., 313, 317, 333, 335, 355, 356; Juan Fernández, 59; Niue, 572, 573–4; Pitcairn, 89; Samoa, 605, 614–15, 634, 635 (fig.), 646, 647; Tokelau, 510, 511–12, 517, 518; *see also* Reparations Estates
Utilization, Hawaiian is., 325, 357, 360 (fig.), 361 (fig.), 362 (figs.), 363 (fig.), 364 (fig.), 366, 368, 369, 370, 371, 372, 373, 374, 375, 382, 416, 421, 430, 433; *see also* Agriculture
Landings, 5; Austral is., 209 (plate), 238, 239, 241; central equatorial is. (general), 456, 491, 493; Clipperton, 15, 17; Cocos, 19; Cook is., 537, 543, 544, 546, 548, 549, 550, 553, 554, 557, 560, 561; Easter, 65 (plate), 67; Galápagos, 42, 44, 49, 50–2, 53, 54; Guadalupe, 10; Hawaiian is., 305, 390, 391 (figs.), 392, 404, 406, 407, 409, 410, 416, 417, 421, 425, 428, 429, 430, 433, 433 (plate), 437, 440, 442, 443 (fig.), 444, 445, 446, 447, 450; Juan Fernández, 61–2, 63; Line is., 476, 479, 481, 482 (fig.), 484, 485, 486, 488, 489, 490; Malpelo, 21; Mangareva, 230, 236; Marquesas, 277–8, 282, 284, 285, 297, 298; Niue, 564; Oeno, 91; Phoenix is., 494, 496, 497, 498, 500, 501; Pitcairn, 77, 80; Rapa, 256; Samoa, 661, 662, 667, 670, 673, 674, 675; San Felix and San Ambrosio, 55; Society is., 145, 146, 159–60, 163, 165, 170, 176, 179, 182; Tokelau, 505, 516, 517; Tuamotu, 183 (plate), 195, 206, 210–26 *passim*; *see also* Jetties and piers
Landslides, 81, 139
Language, *see* English language; French, language; Polynesian: Language; Spanish language
Lantana, 81, 149
Lanuto'o, lake, 586, 587 (plate), 666
La Pérouse, Jean François, Comte de, 70, 444, 591
La Pérouse bay, 66, 78, 680
La Pérouse rock, 300, 444 (fig.)
Lark, 312
Lau group (Fiji), 1
Lauati, chief, 600
Launches, 155, 160 (plate), 161, 171, 176, 178, 180, 189, 371 (plate), 376, 440, 625, 656, 662, 665, 667
Lava, 10, 15 (plate), 22, 23, 24, 28, 32 (plate), 33, 39, 41, 43, 44, 45, 46, 46 (plate), 47 (plate), 49, 52, 53, 55, 56, 63, 68, 81, 142, 165, 183, 187, 230, 261, 302, 303, 303 (plates), 304, 664, 665, 666, 670, 674; fields, 22, 24, 52, 66; flows, 15 (plate), 18, 24, 39, 40, 49, 65, 137, 138, 141, 162, 286, 303, 303 (plate), 309, 414 (with fig.), 415, 416, 426, 432, 439, 442, 445, 585 (with fig.), 586, 587, 590, 660, 661
Law, Cook is., 522, 528, 534, 544; French Oceania, 102, 110–1; Hawaiian is., 315, 356; Niue, 572, 573, 576; Pitcairn, 86, 87–8; Samoa, 600, 604, 606, 628, 629, 630–3, 634, 641, 647, 652; Tokelau, 514; *see also* Courts
Lawson, 31
Laysan, 300 (fig.), 301 (fig.), 312; description, 445, 446
Laysan canary, 446
Lazaroff, Lieut., 561
League of Nations, 4, 582, 601, 602, 627
Lealatele, 628 (table), 663 (fig.)
Leander, H.M.S., 679, 680

Lehua, 439
Le Maire, Jacob, 211, 213, 218
Lemons, 20, 42, 44, 81, 311, 531, 567
Leone, 642, 643, 670, 673
Lepa-ma-Lotofanga, 628 (table)
Leprosy, 77, 112, 269, 354, 355, 553, 638; leper settlements, 112, 202, 214, 304 (plate), 348, 354–5, 423 (fig.), 424, 425
Lepturus bunch-grass, 450, 454 (fig.), 462 (plate), 463, 463 (plate), 477, 480, 483, 486, 493, 496, 497, 502
Lepua, 659
Leulumoeanga, 669
Leusoali'i, 675
Lever Brothers, *see* Lever's Pacific Plantations
Lever's Pacific Plantations, 238, 478, 499
Lianas, 19, 538
Lichens, 29, 30, 256, 480
Lick Observatory, 491
Lido, Punta, 40, 41, 42
Liholiho, *see* Kamehameha II
Lihue, 339, 388 (fig.), 406, 438
Liliuokalani, Queen, 322
Limes, 44, 81, 92, 150, 177, 183, 211, 311, 544, 548, 558
Limestone, 92, 208 (plate), 238, 431, 432, 436, 478, 563; cliffs, 195 (plate), 241, 520 (plate); for building, 136, 170, 233, 521 (plate); for paving, 236; *see also* Coral reefs; *Makatea* (raised reef)
Line islands, 4, 121, 452, 453 (fig.), 454, 454 (plates), 463, 463 (plates), 464, 465, 469, 470, 471, 473, 475, 480 (plates), 481 (plates), 682; northern, description, 475–85 (with figs.); southern, description, 485–91 (with figs.)
Lisianski, Captain Uri, 446
Lisianski island, 300 (fig.), 301 (fig.); description, 446
Lisyanski, *see* Lisianski
Lithothamnium, 676
Liverworts, 30, 46
Livestock, *see under* names of animals
Lizards, 12, 20, 21, 32, 70, 82, 196, 268, 312, 450, 464, 483, 486, 494, 499, 500, 507, 522, 560, 567, 591, 676; *see also* Iguana
Lobería, Punta, 61
Lobos, Isla, 41
Lobsters, 55, 59–60, 223, 464
Local government, French Oceania, 108, 110; Hawaiian is, 348–9, 416, 421, 429, 434, 438, 441; Samoa, 596, 598, 599, 628 (table), 629, 633, 639, 643; Tuamotu, 220; *see also* Administration
Lona, 666
London, 317
London (Christmas island), 478, 481 (plate)
London Missionary Society, Cook is., 522, 526, 527, 530, 552, 556, 558, 562; Hawaiian is., 315; Marquesas, 105; Niue, 575, 577, 579; Samoa, 591, 592, 596, 615, 644–5, 644 (plates); Society is., 100, 116; *see also* Ellis, William; Williams, John
Lone Palm island, *see* Canton island
Long-boats, Samoan, *see Fautasi*
Lono (god), 333
Lord Hood's island, *see* Marutea, South
Lord Howe island (Society islands), *see* Mopihaa
Los Angeles Line, 401
Loto, 558
Low archipelago, 96, 192; *see also* Tuamotu archipelago
Low islands, *see* Island types: Low
Lua Makika, 429
Luma, 675
Lumahei river, 435
Lumber, *see* Timber
Lunalilo, William C., King, 319
Lycopodium, 30, 149

Maalaea, 386, 421, 422
Ma'atea, *see* Makatea, 197
Macadamia, nuts, 358; *ternifolia*, 374
Machinery, 120, 154, 359, 369, 390, 433
McKean island, 455, 456, 459, 466, 468, 472, 473, 499, 683; description, 501–2
McKinley, William, 323
Madeira, 321
Maeva, 133 (fig.), 135, 170, 171
Magdalena, *see* Fatuhiva
Magellan, Ferdinand, 465
Magellan clouds, 556
Magicienne rock, 43
Magistrates, *see* Courts
Magnesium, 676
'Magnolia' (Midway islands), 447
Mahaiatea (temple), 136
Mahanatoa, 250
Mahele, 317
Maheva, lake, *see* Fauna Nui
Mahu, 250
Mahukona, 392, 407, 416, 417
Maia, 675
Maiao, *see* Tapuaemanu
Maize, 42, 48, 70, 74, 78, 117, 248, 357, 358
Makahuena point, 436, 437

Makanalua peninsula, 424, 426
Makapuu point, 411 (plate), 431, 432
Makaroa, 227
Makatea, 3, 96, 107, 113, 119, 120, 122, 126, 127, 153, 192, 194, 195 (plate), 196, 197, 201, 202, 204, 205, 681, 692; description, 205–9 (with figs.), 208 (plate)
Makatea (raised reef), 241, 242, 520, 542–3 (with fig.), 544, 545, 546, 547 (with fig.), 548
Makawao, 422
Makea, Queen, 528, 539; Nui, 529
Makemo, 195, 204, 681; description, 222
Makena bay, 682
Makoi, *see Thespesia populnea*
Makongai, 553
Makua, 434
Makuaiki point, 437
Mala wharf, 409, 420 (fig.), 421, 404 (plate)
Malamocco, Punta, 40
Malanga (visiting trips), 603, 616–17
Malaria, 38, 112
Malay rose-apple, *see Eugenia malaccensis*
Malaya, 372, 646, 650, 692
Malden, Lieut., 487
Malden island, 454, 455, 456, 457, 458 (figs.), 459 (with figs.), 460, 461 (fig.), 464, 466, 468, 469, 473, 485, 568, 683; description, 486–8 (with figs.)
Malden Island Proprietary, 487; *see also* Grice Sumner and Co.
Malie, 604
Malietoa, 616; family, 591, 592, 597, 604, 613; Laupepa, 322, 596, 597, 598; Tanumafili, 598; Vainupo, 592
Malifa, 641, 642
Malolo, M.V., 398
Malpelo, 4, 21, 679
Malua, 592, 644 (with plate)
Mammals, *see under* names
Mana point, 437, 438
'Manahiki Gruppe', 452
Manavatei pass, 216
Mandated territory, 4, 120, 569, 602–4, 627; *see also* Samoa (Western)
Manele bay, 428, 429
Manga, Te, peak, 535
Mangaia, 469, 519, 520, 522, 525, 527, 534, 535, 546, 683; description, 542–5 (with fig.); population, 523 (table)
Manganese, 237, 241, 309
Mangareva group, 71, 95, 96, 104, 110, 113, 118, 126, 127, 151, 192, 198, 201, 209 (plate), 223, 227, 245, 681; description, 227–36 (with figs.), 209 (plate), 71; island, 227–8, 229 (fig.), 681
Mango, 81, 150, 183, 256, 311, 539, 567
Mangroves, 24, 28, 29, 41, 44, 46, 47, 50, 51, 587, 590, 662, 666; absent (from Cocos), 20, (from Tahiti) 149
Manihi, 194, 203, 204, 681; description, 213
Manihiki, 470, 480, 483, 508, 519, 521, 524, 525, 526, 535, 552, 562, 683; description, 553–6, 554 (fig.); population, 523 (table)
Manino pass, 222
Manioc, 117, 183, 208, 235, 245, 247, 248, 274, 651; *see also* Tapioca
Manono, 582, 610 (plate), 613, 628 (table), 666; description, 664–5
Manra (Sydney island), 499
Manu'a group, 582, 601, 604, 606, 608, 613, 616, 629, 642, 644, 684; description, 673–5 (with fig. 674)
Manuae, 519, 524, 683; description, 549
Manuhangi, 216
Manureva, Mt, 239
Manzanilla, *see Hippomane Manzanilla*
Maori, 76, 99, 198, 233, 234, 257, 270, 271, 525, 527, 537
Maps, 6, 689; appendix, 678–84; key to symbols, 8–9
Mapusanga, 643
Maqui, *see Aristotelia maqui*
Maraa point, 144, 147
Marae, *see* Temples, Polynesian
Marblehead, U.S.S., 679
Marchand, French mariner, 104, 285
Marchand island, *see* Uapou
Marchena, 24, 31, 53 (fig.)
Marepa, 160
Margaret, brig, 222
Maria (Austral islands), 96, 104, 236, 237, 681; description, 238
Maria (Tuamotu), 203; description, 224
Marianas islands, 366
Marin, Don Francisco, 313, 359, 367, 370
Marine railway, *see* Slipways
Marists, Society of, 645
Market gardening, 107, 117, 340, 357, 362 (fig.), 363 (fig.), 374, 375, 425, 433
Maro reef, 300 (fig.), 301 (fig.)
Maroe bay, 169, 170
Marokau, 204; description, 217
Marokupenga, 222
Marotiri, 95, 96, 236, 237; description, 258–9 (with fig.)
Marquesas, 2, 4, 75, 76, 95, 96, 97, 104, 108, 109, 110, 112, 115, 117, 121, 126, 127, 232, 257; description, 260–98 (with figs.), 263 (plates), 302 (plates)

Marriage, Austral is., 247; Cook is., 545; Hawaiian is., 343, 344 (fig.), 345 (figs.), 346; Niue, 572; Samoa, 616, 645; *see also* Endogamy; Exogamy; Miscegenation
Marseilles, 274
Marsh, *see* Swamp lands
Marshall islands, 334, 598
Marsters, William, 562
Martin (bird), 33, 567
Maruia (Tuamotu chieftainess), 219
Marutea, North, 203, 681; description, 218
Marutea, South, 203, 205; description, 223–4
Mary Balcout island, *see* Canton island
Mary Balcutt's island, *see* Canton island
Mary Read, brig, 20
Masafau bay, 670
Más-afuera, 47 (plate), 55–60 *passim*, 57 (fig.), 63–4, 64 (plate), 70; *see also* Juan Fernández
Más-á-tierra, 47 (plate), 55–60 *passim*, 56 (fig.), 60–3, 61 (fig.), 62 (fig.); *see also* Juan Fernández
Masse island, *see* Eiao
Mataafa, 597, 598, 600
Matafao, 659 (fig.)
Matafenua, cape, 276
Matahai, 223
Matahiva, 681; description, 214
Matai, *see* Rank (Polynesian), Samoa
Mataiapo, 526
Mataiea, 144
Mataura, anchorage, 243; village, 243, 247, 248, 250
Matautu harbour, 661, 662, 664, 684
Matauvau pass, 159
Matavai bay, 100, 101, 102, 142, 145, 147
Matavanu, crater, 585 (with fig.), 660, 661
Mataveri, 69, 71, 78
Mateiara, Mt, 243
Matson Line, 377, 382, 383, 393, 398, 401, 434, 657, 659 (fig.)
Matsonia, M.V., 398
Matu pass, 145
Matureivavao, 224
Mau movement, 600, 602, 603–4, 626, 639; anti-*mau*, 604; women's *mau*, 614; *Mau a Pule*, 600
Maufene, Mt, 167
Maui, 300 (fig.), 301 (with table and fig.), 302, 306 (fig.), 308, 324, 348, 356, 358 (with fig.), 359 (table), 361 (fig.), 366, 369, 371 (plate), 372, 383, 385 (fig.), 386, 389, 390, 403, 404, 409, 424, 426, 430, 585; airport, 422; description, 418–22 (with figs. and plates)
Maui Pomare, N.Z. government vessel, 579, 649, 656
Mauke, 519, 525, 527, 535, 538, 545, 546, 683; description, 545–6; population, 523 (table)
Maumu, 206, 207, 208–9
Mauna Kea, 304 (plate), 413, 414
Mauna Loa, 302, 303, 304, 413, 414, 415, 417, 424, 585
Maunaroa, 179
Maunga (Samoan chief), 594
Maunga Afi, 660
Maunga Silisili, 660
Maungatapu (Rarotonga), *see* Young's Tooth
Maungatea, 536, 540 (fig.)
Maupiti, 133, 184, 185, 680; description, 186–9 (with figs.)
Mauritius, 116
Maurua, *see* Maupiti
Maxwell, S. R., and Company, 471, 490, 491
Mayor, Dr Alfred G., 676
Maytenus, 29, 46
Meade, Commander, 594, 596
Measles, 638
Meat, 77, 78, 86, 117, 120, 154, 381, 382, 653, 660; *see also* Cattle; Sheep
Medical services, Austral is., 237; central equatorial is., 472, 480, 500; Cook is., 529–30, 539, 545, 548, 553, 559–60; Easter, 77; French Oceania (general), 112; Galápagos, 38; Hawaiian is., 348, 354, 355; Mangareva, 234; Marquesas, 269, 278; Niue, 576–7; Pitcairn, 84, 88; Samoa, 605, 607, 638–41, 660, 664; Society is., 177, 184; Tokelau, 515; Tuamotu, 202
Me'etia, *see* Mehetia
Me'etu, *see* Mehetia
Mehani, Te, 172
Mehetia, 129; description, 161–4 (with figs.)
Melanesia, 73, 75, 76, 77; *see also* Labour: Melanesian
Melbourne, 468, 487
Melons, 81, 150, 196, 220
Melpomene cove, 10, 679
Melville, Hermann, 287, 288
Mendaña, Alvaro de, 104, 275, 281, 465
Mercantile marine, *see* Shipping
Mesozoic fern, 62
'Messageries Maritimes', *see* 'Compagnie des Messageries Maritimes'

Messenger of Peace, mission vessel, 567
Metcalfe, Simon, 313
Meteorological services, 58, 98, 350, 472, 473, 486, 495, 521, 561, 643–4
Meteorology, *see* Climate; Meteorological services
Methodists, 592, 615, 644–5
Metrosideros, 538
Mexican thistle, 310
Mexico, 3, 124, 654 (fig.), 692; and Clipperton, 13, 16; and Guadalupe, 10–11; and Revilla Gigedo, 11–13
Meyerton, 493
Miconia Robinsoniana, 31
Micronesia, 120
Middleton, cape, 12
Midway, 300 (fig.), 301 (fig.), 376, 389, 441, 682; description, 447–9 (with fig.)
Mihiura, 243
Milk, 117, 120
Miller bird, 446
Miller peak, 442
Millersville, 473, 486
Milo, *see Thespesia populnea*
Minerals, 38, 113, 237, 241
Miro, 81, 89
Miscanthus japonicus, 228, 231
Miscegenation, 327, 342–5 (with figs.), 634, 645; Polynesian-Asiatic, 72, 106, 107, 150, 269, 524, 607; Polynesian-European, 72, 82, 106, 150, 269, 332, 508, 524, 600, 603, 607; *see also* Marriage
Missions, 507, 508, 509, 527, 538, 548, 574, 593, 595, 598, 606, 615, 644–6; and education, 112–13, 221, 234, 273, 335, 351, 514, 518, 526, 530, 556, 577, 592, 641–2; and government, 522, 528, 552; and scientific research, 99; and trade, 120–1; *see also* Protestant churches and missions; Roman Catholic church and missions
Mitiaro, 519, 527, 538, 545; description, 546; population, 523 (table)
Mixed farming, 361 (fig.), 363 (fig.), 374, 375, 382, 421, 422, 425
Moamoa, 645
Moaula, 429
Moerai, bay, 241 (plate); village, 237, 241–2
Moerenhout, J.-A., 121, 224, 257
Moerenhout island, *see* Maria (Tuamotu)
Moevai, stream, 276
Mohenjo-Daro, 76
Mohican, U.S.S., 323
Mohitu islet, 215
Mohotani, 260, 262, 266, 269, 273; description, 283–4; profile, 284 (fig.), 295 (fig.)
Mokuaweoweo, 302
Mokuleia, 389, 434
Molasses, 367, 374, 381 (table), 401, 402, 403, 405, 407
Molokai, 300 (fig.), 301 (with fig.), 302, 305, 324, 348, 355, 358 (fig.), 362 (fig.), 369, 386 (with fig.), 390, 398, 408, 423 (figs.), 426, 682; description, 422–6 (with figs. and plates)
Molokini, 430, 433 (plate)
Mongolian fold, *see* Epicanthic fold
Mongoose, 312
'Monoculture', 122
Moorea, 102, 107, 108, 111, 116, 126, 127, 129, 133, 140 (fig.), 680; description, 156–61 (with figs.), 160 (plates), 161 (plate)
Moorhen, 33
Mopihaa, 129, 680; description, 189–90
Morane, 224
Morinda citrifolia, 196, 207, 220, 245, 310, 463, 490, 499, 506, 566
Mormons (Church of Jesus Christ of Latter Day Saints), 200, 322, 615, 643, 644–5
Morotonga, 262 (plate)
Morris, Hedstrom, 656
Morse airfield, 417
Morvan, F., 507
Mosquitoes, 12, 33, 70, 112, 184, 312, 464, 507, 514, 554, 560, 562, 567
Mosses, 30, 256, 282, 480; *see also Lycopodium*; Sphagnum moss
Motane, *see* Mohotani
Motavahi, 243
Motor vehicles, 78, 126, 155, 161, 178, 185, 340, 386, 478, 535, 579, 580, 653, 662, 669
Motu (Niue), 563, 570
Motu Au, 143; Port, 147
Motu Iti (Easter island), 70
Motu Iti (Marquesas), 298
Motu Iti (Society islands), *see* Tubai
Motu Kao Kao, 70
Motu Ko, 557, 558
Motu Kotawa, 557, 558
Motu Ngaongao, Te, *see* Nassau
Motu Nui, 70, 76
Motu One, 129, 189; description, 190
Motu Panao, 212
Motu Puapua pass, 222
Motu Tabu pass, 173
Motu Tunga, 222
Motu Unga (Phoenix islands), 501; *see* Gardner island (Phoenix islands)

Motu Unga (Tongareva), 553
Motu Ura (Kaukura), 212
Motu Uta, 143, 153, 154
Motuini, 147, 148
Motununga, *see* Motu Tunga
Motuoini channel, 146
Motuura (Rimatara), 239
Mouaputa, 157
Mouaroa, 157, 158 (fig.), 160 (plate)
Moumu, *see* Maumu
Mountain apple, *see Eugenia malaccensis*
Mules, 42, 374 (table)
Mulifanua, 648, 665, 666, 669; harbour, 667
Mulinu'u, 597, 599, 600, 629, 630, 643, 657
Mulitapuili peninsula, 666
Mururoa, 195, 203, 681; description, 224–5
Musa fehi, 149, 178, 248, 268, 538, 548
Mutalau, 577
Mutine, H.M.S., 488
Myrceugenia fernandeziana, 62
Myrtle, 62, 64

Nake islet, 490
Namua islet, 582, 666
Nancy, American schooner, 70
Nansouty islet, 143
Nantucket, 497, 501
Nanualele point, 409
Naonao pass, 173
Napali, 305, 437, 438
Napoopoo, 407
Napuka, 196, 198, 203, 681; description, 219–21
Narborough, *see* Fernandina
Nares, Captain, 490
Narragansett, U.S.S., 594, 679
Nassau (Northern Cook group), 519, 524, 683; description, 560
National Geographic Society, 452
National parks, 335, 350 (fig.), 361 (fig.), 417, 421, 422
Nauru, 207, 208, 469, 692
Navigators' islands, 591; *see also* Samoa
Navy Department (United States), *see* United States: Government departments
Nawiliwili, 390, 405, 405 (plate), 406, 437, 438
Necker, 300 (fig.), 301 (fig.), 682; description, 433 (plate), 442–4, 443 (fig.)
Nelson, O. F., 603, 604
Nelson, O. F., and Company, 656 (table)
Nengonengo, 195; description, 216
Nephritis, 354
Nepo pass, 211
Netcher, whaling master, 493
Netherlands East Indies, 380, 653, 692
Neva, Russian warship, 446
New Bedford, 493, 494
New Caledonia, 105, 123, 125, 155, 178, 691
New England, 288, 315, 351, 466, 467
New Hebrides, 322, 579
New South Wales, 467
New York island, *see* Washington island
New Zealand: 90, 311, 320, 495, 524, 527, 538, 539, 560, 593, 594, 597, 600, 683, 693
 Administration, Cook is., 519, 523, 527–9, 558, 561; Niue, 523, 562, 568, 569; Samoa (Western), 582, 600, 602–4, 627–57 *passim*; Tokelau, 504, 514
 Communications, 1–2, 2 (fig.), 90, 125, 154, 155, 180, 253, 256, 382, 434, 535, 579, 594, 660, 656, 664, 692
 Government departments, 523, 528, 569, 628, 644, 678, 683, 684
 Trade, 692; central equatorial is., 469, 471, 489, 490; Cook is., 531, 534, 546, 561; French Oceania, 120, 123 (with fig.), 177, 208, 692; Hawaiian is., 319, 380; Niue, 579; Samoa (Western), 647, 649, 653–4 (with table and fig.)
 See also Maori
New Zealand Shipping Company, 90
Newspapers, 128, 132, 639
Ngake, 558
Nganga'emaunga, 628 (table)
Ngangaifomaunga, 628 (table), 663 (fig.)
Ngarue pass (Fakarava), 209, 210
Ngarue pass (Raroia), 221
Ngarumaova, 221
Ngatangiia, 537
Ngatipa, 536 (plate)
Ngatoaitele, 613
Niau, 183 (plate), 200, 202, 681; description, 211
Nihiru, 218
Nihoa, 300 (fig.), 301 (fig.), 682; description, 433 (plate), 442, 443 (fig.)
Niihau, 300 (fig.), 301 (fig.), 306, 312, 324, 348, 356 (fig.); description, 427 (fig.), 439–40
Ninini point, 405
'Niño', 25, 27 (fig.); current, 25
Nippon Yusen Kaisha Line, 382–3, 434
Niue, 4, 469, 487, 493, 501, 504, 520 (plate), 523, 684; description, 562–80 (with figs.)
Niuefekai, 562; *see also* Niue

Niulii, 417
Niutahi, 212
Noni, see Morinda citrifolia
Nono, see Sandfly
Nonopapa, 440
Norfolk island, 83
North passage (Fanning island) 479
North Seymour island, 45 (fig.), 47
North-east pass (Tongareva), 551, 552 (fig.)
Northern Cook group, *see* Cook islands
Norwegians, 37
Nukuhiva, 98, 104, 121, 127, 260, 262, 263 (plates), 264, 265, 266, 267, 269, 271, 273, 274, 275, 291, 302 (plate), 681; description, 285–90 (with figs.)
Nukunono, 504–16 *passim*, 683; description, 505 (fig.), 516
Nukutao, 546
Nukutavake, 96, 214; description, 215
Nukutipipi, 225
Nuñez, Puerto, 47
Nu'u, 674
Nuuanu Pali, 306, 382 (plate), 387 (fig.), 431, 432, 432 (plate), 434
Nuuanu stream, 398
Nu'ulopa, 610 (plate)
Nu'ulua islet, 582, 666
Nu'usafe, islet, 582
Nu'utele, islet, 582, 666

Oahu, 300 (fig.), 301 (with fig.), 304 (plates), 306, 307 (fig.), 308, 309, 324, 325, 339, 347, 348, 356, 358 (with fig.), 359 (table), 363 (fig.), 366, 369, 371, 374, 376, 379, 383, 384, 387 (fig.), 389, 390, 392 (with fig.), 393 (fig.), 411 (plates), 424, 432 (plate), 585, 678, 682; description, 430–5 (with figs. and plates)
Oahu Railway, 383, 393, 394–6, 397, 398, 435
Oak, 11
Oave, peak, 291 (and fig.)
Obsidian, 65, 76 (plate)
Occupations, Hawaiian is., 335, 336–9 (with fig.), 340, 342; other groups, *see* Economics
Ocean island (Gilbert and Ellice Is. Colony), 207, 208, 469, 499, 500
Ocean island (Hawaiian is.), *see* Kure
Oceanic Steam Ship Co., 382, 657
Octopus, 203, 624; squid, 81, 574
'Octroi de mer', 112, 124
Oeno island, 10, 78, 91 (with fig.), 680
Oeste, Bahía, 61
Ofare, 211
Ofiti, *see* Tepoto (Raevski group)
Ofu, 582, 585, 673; description, 674 (with fig.)
Ohe, see Reynoldsia sandwicensis
Ohia, see Eugenia malaccensis
O'Higgins, Punta, 61
Ohiri, Mt, 179
Oils:
 Mineral, 120; *see also* Fuel, oil; Petroleum products
 Vegetable, 115; *see also* Castor oil plant; Coconut; Copra
Oldham, Commander, 496, 497, 508
Oleander, 183
Olosenga (Manu'a group), 582, 585, 673; description, 674 (with fig.)
Olosenga (Swains island), *see* Swains island
Omoa, bay, 282; river, 282
Omoka, 521 (plate), 551, 552, 553
Oneroa, 543, 544, 545
Ootua, Mt, 275, 276
Oparo, *see* Rapa
Opelu (fish), 376
Opituha, 296
Opium, 105, 269
Opoa, 136, 173, 177
Opunohu, valley, 157
Opuntia, 15 (plate), 28, 29, 45, 311
Oranges, 42, 44, 48, 70, 71, 81, 90, 92, 113, 117, 183, 211, 239, 256, 257, 258, 274, 282, 311, 538, 544, 548, 567; juice, 178, 252, 531; trade, 117, 121, 150, 171, 177, 530, 531 (fig.), 532 (fig.), 534, 539, 545, 546, 549, 551
Orchids, 19, 30, 40, 149
Orchilla, *see Rocella tinctoria*
Orders in Council, 472, 478, 480, 523
Oro (god), 136, 177
Orofara, 112
Orofere valley, 144
Orohena, 136, 141
Oromana, 238
Oropaa, 101
Orovaru, 549
Orthography, 9, 688–9; *see also* Polynesian: Language
Osnaburgh (Bishop of Osnaburgh's island), *see* Mururoa
Otahu pass, 222
'Other Caucasians' (Hawaii, census term), 326–47 *passim*, 350 (table), 352, 356, 370, 374, 378 (table)
Otiaroa channel, 146
Otoya, 48
Otuni pass, 211
Ovahi bay, 66, 78
Owl, 33, 567
Oxford Advanced Atlas, 452

Oystercatcher, 33
Oysters, 224, 446; *see also* Pearls and pearl shell

Paauhau, 416
Paauilo, 416, 417
Pacific Cable Company, 474, 479, 480
Pacific Islands Company, 471, 499
Paea, 142, 144, 155
Paeo, Mt, 167
Paepaeoleia, cape, 661
Pago Pago, 610; *see also* Pango Pango
Pahala, 417
Pahia, Mt, 181, 182 (plate)
Pahoa, 417
Pahuhituone, 286
Pahuta plateau, 276
Paia, 422
Pailolo channel, 422
Paipai pass, 179
Pakaka pass, 212
Pakua pass, 213
Palangi (white man), 608
Palauli, 664; bay, 661, 662; districts, 628 (table), 663 (fig.)
Palawai basin, 426
Pali, The, *see* Nuuanu Pali
Palinurus frontalis, 59–60
Palmerston island, 519, 523, 524; description, 561–2
Palms, 11, 60, 311, 442, 566, 567, 666; *see also* Coconut palms
Palmyra, American ship, 484
Palmyra Development Company, 484
Palmyra island, 454, 454 (plates), 459, 461, 462 (fig.), 463, 463 (plates), 469, 471, 472, 473, 475, 480, 683; description, 483–4
Palu sami, 619
Paluki, 563
Panama, Canal, 2, 13, 90, 98, 180, 252, 256, 290, 382; Gulf of, 25
Pan-American Airways, 2, 389, 434, 447, 449, 473, 474, 484, 485, 494, 495
Pandanus, 81, 98, 149, 183, 196, 207, 208, 215, 220, 223, 224, 229, 231, 238, 245, 249, 256, 267, 284, 310, 454 (plate), 463, 480, 483, 484, 521, 538, 544, 553, 554, 558, 560, 562, 566, 590; use of fruit, 203, 235, 511, 512, 554, 556; use of leaves, 86, 89, 134, 220, 242, 246, 249, 509, 511, 554, 571, 579, 611, 626, 673
Pandora, H.M.S., 92, 507, 591
Pango Pango, 2, 586, 653, 684, 692; administration, 629, 632, 643, 660; climate, 589–90; communications, 485, 651, 654, 673; history, 592, 594, 596, 601; hospital, 640; port, 586 (plate), 587, 587 (plate), 655, 657–60 (with figs.); town, 606, 652, 660; trade, 593, 651, 654
Panicum stenataphroides, 477, 493
Paopao, bay, 157, 159, 160, 161, 680; valley, 157
Paopao (canoe), 625
Papakena, *see* Tureia
Papakino winds, 67
Papara, 100, 136, 144
Papaterangi, temple, 219
Papaya, 20, 44, 48, 81, 183, 196, 208, 215, 219, 220, 245, 256, 311, 374, 382, 483, 491, 506, 512, 522, 538, 539, 548, 558, 562, 566
Papeari, 144, 147, 148, 155; harbour, 146
Papeete, 2, 95, 106, 107, 116, 117, 139, 150, 165, 230, 680, 692; administration, 108, 109, 110, 124, 150; climate, 147, 148; communications, 125, 127, 155, 161, 171, 178, 180, 204, 274, 290, 535; hospital, 112; pass, 142, 145, 147, 151; port, 98, 142, 143, 145, 150 (fig.), 151–4 (with fig.), 154 (plate); town, 3, 150, 151 (plate), 154, 154 (plate); trade, 126, 151, 166, 203, 248, 252, 593
Papeivi pass, 147
Papenoo, river, 141; valley, 145
Paper-bark tree, 375
Paper mulberry, *see Broussonetia papyrifera*
Papetoai, bay, 157, 159, 160, 160 (plate), 161; village, 160, 161
Papeuriri, bay, 142, 146
Paraoa, 216
Paris (Christmas island), 478
Parrakeet, 464, 483, 567, 624
Parrot, 312, 590
Part-Hawaiians, 326, 327 (with table), 328 (fig.), 329 (table), 330, 331 (fig.), 335 (table), 338, 341 (table), 343 (with table), 344 (fig.), 345 (fig.), 350 (table), 352, 355, 356, 370 (table)
Partida, Roca, 13, 679
Pascua, Isla de, 64; *see also* Easter island
Pasion, Isla de la, 16; *see also* Clipperton island
Paspalum grass, 267, 268
Passes, *see* Ship passes
Passion fruit, 150
Patamea, 661
Paths, *see* Tracks
Patio, 179
Patrickson, mariner, 555
Pauahi, Princess Bernice (Mrs Bishop), 352

Paulet, Captain Lord George, 317
Paumotu islands, 103, *see also* Tuamotu archipelago
Pauwela, 422; point, 420
Peaches, 71, 368
Peacock, *see* Ahe
Peacock, U.S.S., 497
Pearl and Hermes reef, 377, 432 (plate); description, 446
Pearl City, 434
Pearl harbour, 319, 323, 325, 330, 366, 387 (fig.), 392, 431, 432, 433, 434, 435
Pearls and pearl shell, 163, 204, 216, 218, 233, 478, 561; export, 113, 118–19 (with fig.), 121, 124, 204, 523, 529, 531, 553, 556; fishing, 103, 118, 165, 197, 199, 203, 204, 213, 218, 221, 224, 225, 234, 235, 377, 446; oyster, 212, 235, 377
Pelau point, 427
Pele (Goddess of Fire), 304, 333
Pelekunu, 424
Pelican, 11
Penal settlements, 59, 63, 83, 105, 297
Penrhyn island, *see* Tongareva
Peoples, *see* Americans; Asiatics; Europeans; Polynesian
Pepeekeo point, 400
Perahu, Mt, 254 (with fig.), 255 (fig.)
Perigot bay, *see* Puamau bay
Permanent Committee on Geographical Names, 9, 686–90 *passim*
Perovaki pass, 213
Perry isthmus, 31, 49, 50, 51
Peru, 25, 35, 100; labour traffic, 70, 507, 508, 516, 523, 552, 558, 568
Peru current, *see* Currents
Peruano, Spanish frigate, 59
Pétain, Marshal Philippe, 691
Petrels, 33, 245, 312, 446, 464, 496
Petroleum products, 154, 372, 393, 399 (tables), 402, 405, 407, 534, 579, 692, 693
Phaeton, Port, 98, 127, 139, 142, 144, 146, 154, 155; description, 145
Pheasant, 312
Philippines, 321, 323, 377, 389
Phoenix Guano Company, 468–9, 496, 497, 502
Phoenix island, 454, 456, 459, 464, 466, 468, 472, 473, 494, 501, 683; description, 496
Phoenix islands, 4, 452, 453 (fig.), 454, 456, 457, 459, 460, 466, 469, 470, 471, 472, 473, 475, 477, 515, 682; description, 494–502 (with figs.)
Phosphate, 3, 444; Baker, 492, 493; central equatorial is. (general), 456, 467–70; Clipperton, 14, 16, 17; Cook is., 522; Galápagos, 38; Hawaiian is., 445, 446, 450; Howland, 493; Line is., 454, 485–9 *passim*; Makatea, 113, 114 (fig.), 119–20, 122, 123, 124, 153, 202, 204, 206–9 (with figs.), 208 (plate), 692; Niau, 211; Peru, 70; Phoenix is., 494–501 (with fig.); phosphoric acid, 544, 548
Physical geography, *see under* names of individual islands and groups
Picpus, Congregation of (Congregation of the Sacred Hearts), 71, 73, 104
'Picture brides', 321, 330
Piers, *see* Jetties and piers; Wharves
Pigeons, 208, 268, 567, 590, 624
Pigs, 16, 20, 32, 44, 48, 49, 58, 70, 82, 117, 151, 160, 161, 164, 170, 177, 184, 185, 189, 221, 231, 235, 239, 242, 248, 249, 268, 272, 273, 296, 312, 374 (and table), 487, 490, 500, 507, 518, 522, 539, 545, 551, 553, 560, 567, 574, 590, 611, 619 (with fig.), 620, 624, 647, 651
Pihaa, Port, 146
Pihaena, 160
Pillihai pudding, 85
Pilo, 311
Pinaki, 214; description, 215
Pine, 11, 89
Pineapple Producers Co-operative Association, 368, 382
Pineapples, 48, 81, 161, 170, 171, 177, 178, 183, 185, 208, 248, 311, 323, 357, 358, 367–70 (with fig.), 374, 425, 428, 433, 548, 551; plantations, *see* Plantations: Pineapple; canning, *see* Canneries, pineapple; trade, 113, 151, 380, 381 (table), 399 (table), 400, 405, 408, 531, 692; transport, 383, 383 (plate), 410
Pinta, 30, 31, 52–3, 52 (fig.)
Pinzón, 24, 31, 45 (fig.), 48
Pipe-lines, 308, 358, 359 (table), 393, 401, 403 (with fig.), 404, 405, 674
Piper, 566; *methysticum*, 617
Pisonia, 196, 219, 220, 267, 284, 285, 297, 454 (plate), 483, 487, 489, 490, 499, 500, 501, 554, 558, 560, 676; *grandis*, 463, 480, 484
Pitcairn, Ensign, 82
Pitcairn island, 2, 4, 64, 77 (plates), 78–90 (with figs.), 91, 92, 562, 680; Pitcairn Island Regulations, 87; *Pitcairn Island Register Book*, 82, 94
Pito o te Henua, Te, 64; *see also* Easter island

Pitt head, 19
Place-names, 7, 9, 22, 35, 99, 685–90
Plaiting, 247, 249
Plantations, European:
General, 32, 39, 40, 42, 46, 48, 71, 72, 312, 319, 325, 326, 329, 336, 338, 339, 340, 346, 353, 354, 357, 373, 378, 379, 383, 386, 389, 406, 422, 428, 434, 435, 599, 606, 633, 644, 647, 665
Banana, Marquesas, 288; Samoa, 634, 668 (fig.)
Coconut, central equatorial is. (general), 470–1, 473; Cook is., 534, 549, 560, 561; Line is., 477, 478, 480, 483–5, 490, 491; Marquesas, 274, 284, 288, 297; Phoenix is., 499–502; Samoa, 593–4, 648, 649, 668 (fig.), 669; Society is., 122, 165, 166, 171, 186, 190; Tokelau, 518; Tuamotu, 225
Coffee, Hawaiian is., 370; Marquesas, 288; Society is., 116
Cotton, Hawaiian is., 371; Society is., 116, 121–2
Fruit, Cook is., 534
Pineapple, Hawaiian is., 305 (plate), 325, 355, 360 (fig.), 361 (fig.), 362 (fig.), 363 (fig.), 364 (fig.), 367, 369, 370 (plate), 382, 421, 429, 438; Samoa, 646
Rubber, Samoa, 650
Sugar, Galápagos, 36, 38; Hawaiian is., 320, 337, 359, 366, 382, 390, 402, 405 (plate), 407, 416, 417, 421; Society is., 115, 116, 161
Vanilla, Society is., 115
See also Agriculture; Labour
Platinum, 241
Plover, 464, 496, 590
Pneumonia, 354
Poike, 65, 67 (fig.), 68 (fig.)
Police, 356, 514, 529, 576, 632
Political control, 3 (with fig.); *see also* Sovereignty
Political status of Polynesians, *see* Citizenship
Politics, 343, 346–7, 348, 349; *see also* Administration; *Mau*
Polyandry, 271
Polygyny, 510, 572
Polynesian: 4, 7, 464, 499, 500
Culture, 3, 10, 64, 82; Cook is., 526–7, 544, 556, 558–9; Easter, 73–5, 76, 77; French Oceania (general), 107, 108; Hawaiian is., 332, 333, 334; Mangareva, 232, 233–4; Marquesas, 271–2, 273; Niue, 571–5; Samoa, 610–26 (with figs.); Society is., 132–6, 170–1, 177, 184, 188; Tokelau, 509–13, 518; Tuamotu, 197–200, 215, 220–1; Tubuai, 246–8
Language, 688–90; Cook is., 525–6; Easter, 73; French Oceania (general), 108; Mangareva, 232, 234; Marquesas, 270; Maupiti, 188; Niue, 570–1; Tahiti, 132, 221; Tokelau, 508, 514; Tuamotu, 197, 198, 202, 221; Tubuai, 246, 247
Physical type, 108; Cook is., 525; Easter, 72–3, 74–5; Hawaiian is., 131, 332; Marquesas, 269–70; Niue, 570; Pitcairn, 84; Rapa, 108 (plate); Samoa, 609–10 (with fig.), 620 (fig.), Society is., 131–2; Tokelau, 508, 518; Tuamotu, 108 (plate), 197; Tubuai, 246
Religion (ancient), Cook is., 527, 556; Hawaiian is., 315, 332, 333; Mangareva, 233, 234; Marquesas, 271; Niue, 563, 573, 575; Samoa (general), 614, 615, 641, 645; Society is., 99, 108, 133 (fig.), 135, 136, 177; Tokelau, 509, 511, 513; (modern) *see* Protestant churches and missions; Roman Catholic church and missions
See also Archaeology; Labour: Polynesian; Population
Polypodium phymatodes, 463, 463 (plate), 483, 484, 560
Pomare, family, 101–2, 165, 197; origin of name, 102
Pomare I (Tu), 101–2, 198; II, 102, 103, 116, 160; III, 102; IV (Queen), 101, 102, 103; V, 102, 109, 252
Pomegranates, 311
Popoi, *see* Breadfruit
Population:
Austral is., 237, 239, 241, 245–6, 252; central equatorial is. (general), 473, 477, 480, 483, 486, 490; Clipperton, 17; Cocos, 21; Cook is., 523 (with table), 524, 539, 544, 546, 548, 549, 551, 552–3, 556, 558, 562; Easter, 72; French Oceania (general), 95 (table), 105–8; Galápagos, 37, 44; Guadalupe, 11; Hawaiian is., 319, 320, 324–32 (with figs. and tables), 336, 339, 382, 386, 392, 416, 428, 429 430, 440; Juan Fernández, 59; Mangareva, 232; Marquesas, 269, 278, 281, 282, 284, 285, 288, 292, 295, 297; Niue, 569–70 (with table); Phoenix is., 497, 499, 500, 501; Pitcairn, 82–3; Rapa, 257; Samoa (general), 604–7 (with fig.), 657, 673; Society is., 150, 154, 160, 163, 166, 171, 177, 180, 184,

Population (*cont.*):
189; Tokelau, 508, 516, 518; Tuamotu, 197, 208, 210–26 *passim*
Age distribution, 106, 330, 331 (fig.), 332; density, 72, 105, 324, 508, 605; pressure, 471, 508, 512, 515; sex ratio, 72, 83, 106, 271, 321, 327, 330, 331 (fig.), 332, 343, 524, 569; trends, 83, 106–7, 326, 327, 328 (fig.), 523–4, 544, 569, 605; *see also* Birth-rate; Death-rate; Depopulation; Settlements
Porionuu, Te, 101
Porphyrio, see Swamp hen
Porpoise, U.S. brig, 491
Porter, Captain David D., 35, 104, 288
Portland, H.M.S., 681
Porto Ricans, in Hawaiian is., 320, 321, 341 (table), 344 (fig.), 345 (fig.), 366, 370 (table), 378 (table)
Ports and harbours, Cook is., 520, 535, 537, 539, 540 (fig.), 541 (with fig.); French Oceania, 98, 145–7, 151–4 (with figs.), 151 (plate), 154 (plate), 170, 176, 180, 182, 238, 252, 256, 264, 278; Galápagos, 40; Hawaiian is., 325, 357, 383, 389–411 (with figs.), 398 (plate), 404 (plate), 405 (plates), 410 (plate), 416, 421, 425, 428, 433, 437, 448 (fig.); Samoa, 587, 645 (plates), 655–60 (with figs.), 661–2, 666–7; *see, also* Anchorages; Communications; Ship passes
Portsmouth, U.S.S., 683
Portuguese, in Hawaiian is., 320, 321, 326, 327, 328 (fig.), 329 (with table), 335 (table), 338, 340, 341 (table), 343 (with table), 344 (fig.), 345 (fig.), 350 (table), 352, 366, 370 (table), 378 (table)
Portulaca, 220, 454 (fig.), 477, 493, 496, 502; *lutea*, 463, 486
Postal services, central equatorial is. (general), 475, 480, 496; Cook is., 529; Easter, 86; French Oceania (general), 127; Hawaiian is., 389; Marquesas, 274
Post Office bay, 24, 44
Potatoes, 81, 113, 248, 257, 310, 340, 368, 374, 380, 381 (table), 539, 545; *see also* Sweet potatoes
Poultry, 42, 48, 70, 82, 117, 151, 164, 184, 189, 196, 221, 235, 248, 268, 292, 312, 333, 490, 500, 507, 518, 522, 539, 545, 551, 553, 560, 567, 574, 611, 647, 667
Poumaka, peak, 291 (fig.)
Pouoanuu, Mt, 276
Poutetainui, peak, 291 (with fig.)
Power stations, *see* Electricity
'Praha' settlement, 288
Predpriatie, *see* Fangahina
Prickly pear, *see Opuntia*
'Prime', 114, 115, 124
Prinz Eitel Friedrich, German warship, 72
Prisons, 351, 356
Pritchard, George, 592
'Procureur de la République', 110
Progreso, 33 (plate), 36, 37, 38, 39, 40, 42, 43
Property, 161, 247, 633; communal, 87–8, 220, 527, 530, 545, 573, 614, 615, 636; individual, 200, 219, 271, 527, 553, 573, 615, 636; in fishing grounds, 134, 511, 553, 558, 574; *see also* Land
Prospect island, *see* Washington island
Protestant churches and missions, 59, 85, 103, 121, 154, 200, 245, 312, 315, 316, 322, 337, 340, 341, 500, 507, 508, 599, 644–5, 644 (plate); *see also* Churches; London Missionary Society; Mormons; Seventh Day Adventists
Providence, H.M. sloop, 490
Psidium, 30
Puakala, *see* Mexican thistle
Puamau, bay, 264, 277; settlement, 269, 278; valley, 276
Pu'apu'a, 661, 664
Puarautonga (temple), 201 (fig.)
Puave, cape, 661
Public service, *see* Administration
Puerto, *see under* proper names
Pueu, Port, 146
Pufau, bay, 176
Puget sound, 401
Puheva pass, 222; village, 222
Puhioono bay, 284
Puka, see Pisonia
Puka, Te, *see* Napuka
Puka a Maruia, Te, *see* Napuka
Pukapuka (Cook islands), 218, 507, 519, 521 (plate), 535, 560, 683; description, 557–60 (with figs.); population, 523 (table)
Pukapuka (Tuamotu), 196, 201, 219, 681; description, 218
Pukararo, Te, *see* Tepoto (Disappointment islands)
Pukararo (Vairaatea), 215
Pukarua island, 194 (plate), 202; description, 214
Pukarua islands (Disappointment islands), 219; *see also* Napuka; Tepoto
Pukarunga, Te, *see* Napuka
Pukarunga (Vairaatea), 215

Pukoo, 424
Pukumaru, Mt, 254, 255 (fig.)
Pukutaketake, 254 (fig.), 255 (fig.)
Pule, mount, 586, 660
Pule, political party, 600, 613; title to land, 615, 636
Pulenu'u (mayor), 514, 629, 631
Pumpkins, 20, 48, 71
Punaauia, 143 (plate), 144
Punaeroa pass, 173
Punaluu, 407
Punaruu, river, 140, 141, 144; valley, 141
Punchbowl, 398, 398 (plate)
Punta, *see under* proper names
Puratea bank, 216
Purslane, *see Portulaca*; *Sesuvium*
Puruu, 81, 89
Puueo, 416
Puukukui, 418, 420
Puunoa point, 409
Puutiare, 205
Pylades, H.M.S., 683

'Quais', *see* Quays
Quarantine, 354, 371, 375, 393, 396 (table)
Quatres Facardins, Les, *see* Vahitahi
Quays, Honolulu, 393; Kaunakakai, 408; Papeete, 152 (fig.), 153; *see also* Wharves
'Quebrada', *see* Ravines
Quebrada de las Casas, 63, 64 (plate)
Quebrada de Sanchez, 63
Queen Charlotte islands, 1
Queen Charlotte's island, *see* Nukutavake
Queen Street (Honolulu), 397, 398
Queen Victoria, 523, 568
Queensland, 116
Quiros, Pedro Fernandez de, 103, 205, 211, 216, 223, 224, 225, 465, 507, 518
Quotas, 380

Rabbits, 312, 445, 446, 464, 493, 496
Rabida, 24, 31, 49
Race, *see* Polynesian: Physical type
Race relations, 342, 346
Rada de Playa Prieta, *see* Black Beach road
Radio, *see* Radio telephony; Wireless telegraphy
Radio telephony, 389, 417, 422, 426, 429, 438
Radium, 646
Raevski group, 222, 681
Rafts, 235
Raiatea, 99, 101, 102, 103, 110, 112, 126, 127, 129, 133, 136, 155, 171, 179, 180, 184, 185–8, 189, 257, 566, 680; description, 172–8 (with figs.)
Rail (wild bird), 33, 268, 446, 624
Railways, Hawaiian is., 338, 359, 367, 378, 383, 383 (plate), 384 (fig.), 385 (fig.), 387 (fig.), 388 (fig.), 390, 392, 393, 401, 402, 404, 406, 407, 410, 411 (plate), 417, 419 (fig.), 422, 435, 438; Maketea, 208 (plate), 209; *see also* Tramways
Rainfall, *see* Climate
Ra'iroa, 197; *see also* Rangiroa
Raiurua, bay, 238, 250; village, 252
Raivavae, 98, 104, 237, 247, 681; description, 250–2 (with fig.)
Rakahanga, 519, 524, 525, 562, 683; description, 553–6, 555 (fig.); population, 523 (table)
Ranching, 70, 71, 312, 357, 373, 374, 378, 416, 425, 428, 438, 440
Rangatira, 526
Rangiroa, 183 (plate), 192, 194, 195, 197, 198, 202, 203, 681; description, 213
Rank (Polynesian), Austral is., 233, 242, 247; Cook is., 526, 527, 528, 539, 544, 546, 548, 552, 553, 556, 559; French Oceania (general), 99, 100, 101, 102, 110; Hawaiian is., 332; Marquesas, 271, 273; Niue, 568, 571, 572–3; Rapa, 257; Samoa, 591, 594, 596, 600, 601, 603, 608, 612–14, 615, 616–22 (with figs.), 629, 630, 632, 633, 634, 636, 639, 640, 647; Society is., 135–6, 170, 171, 184, 188; Tokelau, 509, 510, 511; Tuamotu, 197, 202, 219, 220
Rano Aroi, 66, 66 (fig.), 69
Rano Kao, 64 (plate), 65, 68 (figs.)
Rano Roraku, 65, 65 (plate), 67 (fig.), 68 (fig.), 69, 74
Rapa, 2, 65, 95, 96, 98, 104, 108 (plate), 112, 151, 235, 236, 237, 242, 259, 262 (plates), 681; description, 252–8 (with figs.)
Rapa Hue, *see* Rapa
Rapa Iti, 252; *see also* Rapa; islet, 252
Rapa Nui, 64; *see also* Easter island
Rapa passage (Fanning island), 479
Raphidophora, 587 (plate)
Raraka, 681; description, 223
Raroia, 195, 204, 221, 681; description, 221
Rarotonga, 232, 507, 519–30 *passim*, 534, 535, 536 (plates), 544, 545, 546, 548, 549, 551, 552, 553, 556, 558, 559, 560, 567, 592, 683; description, 535–42 (with figs.); population 523 (table)

Rats, 20, 32, 38, 81, 196, 312, 490, 494, 497, 499; Alexandrine, 483; black, 32; damage by, 115; Norway, 464, 493, 567; Polynesian, 70, 231, 268, 312, 464, 493, 500, 506, 507, 522, 554, 567, 590, 611, 624, 676; rice, 32
Rattler, ship, 20
Rautirare pass, 142, 145
Rautoanui pass, 173, 176
Ravahere, 681; description, 217
Ravines, 13, 47 (plate), 50, 56, 62–3, 68, 287, 424, 428
Reao, 112, 198, 201, 202, 205, 235, 681; description, 214
Recreation, 340, 377, 378, 432, 657; *see also* Dancing
Red Berries, Island of, *see* Nu'ulopa
Redondo, Roca, 52
Reed warbler, 464
Reeds, freshwater, 140–1, 149, 309, 463, 548
Reefs (coral), *see* Coral reefs
Refrigeration, 154, 177, 393, 429, 473, 480, 486, 539, 660
Register Book, Pitcairn Island, see Pitcairn Island Register Book
Reid island, *see* Tuanaka
Reindeer, H.M.S., 490
Reine, La, valley, 141
Reirson island, *see* Rakahanga
Reitoru, 218
Rekareka, 217, 681; description, 218
Religion, *see* Buddhism; Christianity; Missions; Polynesian: Religion (ancient); Protestant churches and missions; Roman Catholic church and missions; Shintoism
Reparations Estates, 602, 634, 635 (fig.), 646, 650, 651, 656 (table)
Reptiles, *see* Iguana; Lizards; Snakes
Republican Party, 346, 347, 350
Reserves, bird, 312, 448, 449, 450, 497, 502, 561; forest, 335, 357, 359, 360 (fig.), 361 (fig.), 363 (fig.), 364 (fig.), 375, 416, 421; game, 11, 31
Resolution, H.M.S., 334
Resolution bay, *see* Vaitahu
Resolution island, *see* Tauere
Revilla Gigedo islands, 3, 11–13, 679
Reynoldsia sandwicensis, 310
Rhinoceros beetle, 115, 591, 629
Rice, 132, 311, 340; cultivated, 107, 117, 150, 161, 248, 358, 359 (with table), 370 (plate), 371, 372, 438; exported, 380; imported, 117, 120, 273
Ricord, John, 317
Rikitea, 127, 201, 230, 233, 234, 235, 236, 681; cathedral, 232–3; port, 230; settlement, 209 (plate), 232–3
Rimatara, 104, 237, 238, 242, 681; description, 238–9
Rimatuu, 165
Ringgold, Lt.-Commandant Cadwalader, 226
Rivadeneira, Diego de, 35
Rivers and streams, Austral is., 239, 243; Cocos, 18, 19; Cook is., 520, 536; Easter, 66; Galápagos, 40, 47; Hawaiian is., 302, 306 (fig.), 325, 333, 376, 377, 410, 415, 418, 427, 432, 433, 435, 437; Juan Fernández, 58, 64; Marquesas, 96, 262, 266, 276–7, 282, 284, 286, 287, 291, 293, 296, 297; Pitcairn, 81; Samoa, 586, 587, 661, 665, 669, 670, 675; Society is., 96, 135, 140, 141, 144, 148, 155 (plate), 160, 172, 173, 183
Roads, Austral is., 239, 250, 252, 258; central equatorial is., 475, 478, 481, 499; Cook is., 535, 540 (fig.), 541–2 (with fig.), 545, 546, 549, 551, 556, 557 (fig.), 560; Easter, 78; French Oceania (general), 126; Galápagos, 39, 43, 44; Hawaiian is., 351, 374, 382 (plate), 384 (fig.), 384–6, 385 (fig.), 386 (fig.), 387 (fig.), 388 (fig.), 390, 392, 393, 402, 404, 406, 409, 410 (plate), 411 (plate), 415, 419 (fig.), 422, 425, 426, 429, 434–5, 438, 440; Juan Fernández, 60; Niue, 568, 576, 580; Pitcairn, 90; Samoa, 654, 662–4 (with fig.), 667–9 (with fig.), 670, 672 (fig.), 673, 675; Society, 139 (fig.), 145, 154 (plate), 155, 155 (plates), 157 (fig.), 161, 169 (fig.), 175 (fig.), 178, 180, 182 (plate), 185, 189; Tokelau, 519; Tuamotu, 204, 209, 211, 219, 223
Robinson Crusoe, 58; Robinson Crusoe's Lookout, 62 (fig.)
Roca, *see under* proper names
Rocella tinctoria (dyer's moss), 29, 36, 40
'Rocher Clipperton', *see* Clipperton rock
Rocks, conglomerate, 261; igneous, 243; metamorphic, 241; sedimentary, 262, 263; volcanic, 14, 14 (plate), 24, 28, 46, 78, 79, 136 (plate), 137, 142 (plate), 177, 241, 298, 300, 308, 444, 536, 542, 586; (ashy), 19, 23, 28, 46, 50, 52, 55, 56, 65, 74, 81, 142, 163, 261, 436, 441, 665; (pumicious) 241; as building material, 74, 75, 136, 236; *see also* Basalt; Lava; Limestone; Obsidian

Rock-wren, 11
Roggeveen, cape, 66
Roggeveen, Jacob, 64, 70, 205, 211, 465, 591, 686
Roman Catholic church and missions, 37, 59, 73, 100, 105, 121, 154, 197–200, 220, 225, 232, 278, 302 (plate), 316, 340, 352, 355, 478, 508, 509, 513, 527, 530, 556, 592, 599, 615, 643, 644–5; *see also* Picpus, Congregation of
Roniu, 136
Rooke, Emma, 318
Rope, The, 79
Ropeways, 367, 390, 391 (fig.), 416
Rose atoll, 582, 585; description, 675–6
Rose island, 675, 676
Rosewood, 183
Rotenone plants, 113
Rotoava, 201, 210, 211
Rotui, 157, 158 (fig.), 161
Rotuma, 3
Rougier, Father Emmanuel, 478, 683
Royal Mail Line, 434
Royal Society, The, 490
Rua i Kakau, Te, passage, 549, 550
Ruahara, 551
Rubber, 372, 373, 591, 637, 646 (with table), 650, 651 (fig.), 654 (fig.), 692
Rule, cape, 12
Rum, 116, 151
Rurik, *see* Arutua
Rurutu, 104, 115, 209 (plate), 237, 238, 246, 249, 681; description, 239–42 (with figs.)
Russell, Captain Lord Edward, 224
Russia, and Hawaiian islands, 313, 314, 315, 398; exploring expedition, 465, 555; *see also* Bellingshausen; Kotzebue
Russian-American Company, 561
Rutaki, 536 (plate)

Sacred Hearts, Congregation of, *see* Picpus, Congregation of
Safata, 669; bay, 666, 667
Safotulafai, 664
Safune bay, 661, 662
Sailing craft, 47 (plate), 160, 239, 257, 278, 468, 469, 470, 522, 564; Cook is., 551, 552, 561; French Oceania, 125–6, 134, 151 (plate), 152 (fig.), 153, 194 (plate), 195 (plate), 198, 215; Samoa, 6, 25; Polynesian ownership, 203, 242, 250; *see also* Canoes; Communications
St George Expedition, 6
St Paul's point, 79
Sala y Gomez, 78, 680
Sala'ilua, 664; bay, 661, 662
Saleaula, 628 (table), 663 (fig.)
Salelolonga, 661, 662, 664
Salenga, 628 (table)
Salia, cape, 661
Salmon, Alexander, 71
Salt, 14 (plate), 38, 41, 49, 89, 476, 488, 492
Saluafata, 587, 669; harbour, 666, 667, 684
Samoa, 3, 9, 121, 322, 383, 466, 504, 507, 509, 510, 513, 515, 516, 518, 522, 537 (plates), 539, 567, 568, 569, 574; general review, 582–660 (with figs. and plates); individual islands, 660–76
Samoa, Eastern, *see* Samoa (American)
Samoa (American), 4, 508, 519, 537 (plate), 586 (plates), 587 (plate), 591–607 *passim*, 608, 614, 627–60 *passim*, 645 (plate), 657 (fig.), 682, 684, 692
Samoa (Western), 4, 508, 514, 515, 516, 537 (plate), 569, 579, 587 (plate), 591–607 *passim*, 608, 610 (plate), 614, 615, 627–57 *passim*, 644 (plates), 645 (plate), 656 (fig.), 660–9, 673, 684, 692; Vicariate Apostolic of, 645
Samoa Shipping and Trading Company, 499, 560
Samoan Co-operative Trading Society, 600
Samoan language, 514, 570, 610
Samoans, 270, 332, 508, 518, 571; as mission teachers, 567, 575, 580; *see also* History; Samoa
Samusu point, 666
San Ambrosio, 54–5, 679
San Benedicto, 13
San Carlos, Punta, 61
San Cristóbal, 25, 30, 31, 32, 33 (plate), 36, 37, 38, 39–43, 41 (fig.), 46, 679
San Diego, 38
San Felix, 54–5, 679
San Francisco, 125, 155, 377, 383, 389, 401, 470, 471, 478, 481, 495, 534, 594, 657, 660
San Juan Bautista, Bahía, *see* Cumberland bay
San Narcise, *see* Tatakoto
San Pablo, *see* Hereheretue
San Pedro, *see* Mohotani
San Salvador (Galápagos), 24, 30, 31, 32, 33, 38, 45 (fig.), 48–9
San Tomás, 37, 38, 39, 50, 52
Sand, composition, central equatorial is., 456; dunes, 145, 432, 436, 437, 449, 455, 475, 477, 560
Sand island (Honolulu), 393, 398
Sand island (Johnston), 449, 450
Sand island (Midway), 447, 449
Sand island (Rose atoll), 675

Sandalwood, in Austral islands, 252; in Hawaii, 310, 312, 314, 325, 360; in Juan Fernández (*Santalum fernandezianum*), 60; in Marquesas, 105
Sandfly, 268
Sands islands, *see* Maria (Austral islands)
Sandwich, Earl of, 312
Sandwich islands, 312; *see also* Hawaiian islands
Sandwich Islands Mission, 315
Santa Clara, 56
Santa Cristina, *see* Tahuata
Santa Cruz, 15 (plate), 25, 30, 31, 32, 37, 38, 39, 45–8, 45 (fig.), 46 (plate), 47
Santa Fé, 31, 32, 45 (fig.), 48
Santa María, *see* Floreana
Santalum fernandezianum, 60; *see also* Sandalwood
Sapapali'i, 611 (plate), 644 (plate)
Sappho, H.M.S., 679
Sappho cove, 41, 42
Sarah Anne, American schooner (wrecked), 225
Sataua, 664
Satupaitea, district, 628 (table); road, 662
Savage island, *see* Niue
Savai'i, 537 (plate), 582, 584 (fig.), 585, 586, 587, 589, 592, 598, 600, 605, 606, 608, 613, 628, 629, 630, 635 (fig.), 638, 642, 644, 644 (plate), 645, 648, 667, 669, 684; description, 660–4 (with fig.)
Sawle, mariner, 484
Scaevola, 309, 483, 494, 499, 560; *frutescens*, 449, 463, 477, 480, 506, 590
Scalesia, 30, 46
Scharnhorst, German warship, 151, 183
Scheffer, Dr, 314, 315
Schofield Barracks, 434
Schools, *see* Education
Schooner pass, *see* Pakaka pass
Schooners, *see* Sailing craft
Schouten, Willem Corneliszoon, 211, 213, 218
Scientific expeditions, 6, 79, 283, 465, 490, 491, 495, 555, 591, 643, 676, 683; *see also* United States: Exploring Expedition
Scilly, *see* Fenua Ura
Scirpus riparius, 483
Scoria, *see* Rocks, volcanic
Scorpions, 34, 591
Script, Easter island, *see* Tablets, pictographic
Sea lions, 24, 30
Sea morning-glory, *see* Convolvulus
Seals, 35, 55, 444, 446; fur, 33, 58, 59; elephant, 11, 58; seal hunting, 70; seal oil, 58; seal skins, 58
Sedges, 62, 268, 309, 418, 483, 560
Seismic sea waves, 56, 265, 538, 554, 558
Seismology, 56, 302, 303, 565, 644; *see also* Seismic sea waves
Sekelangi pass, 551
Selcraig, Alexander, 58
Selkirk, Alexander, *see* Selcraig
'Sensitive plant', 149, 177
Serle's island, *see* Pukarua island
'Service judiciare, Chef du', 110
Sesuvium, 309, 454 (fig.), 462 (plate), 496, 497; *portulacastrum*, 463, 486, 502
Settlements, Austral is., 239, 241, 247; central equatorial is., 472, 473, 477–8, 480, 481 (plate), 483, 488, 490, 493, 494, 495, 497, 499, 500, 501; Clipperton, 17; Cocos, 21; Cook is., 521 (plates), 539, 540 (fig.), 542, 544, 545, 546, 548, 549, 551, 552, 553, 557 (fig.), 558, 562; Easter, 69, 71, 72; Galápagos, 33 (plate), 36, 37, 46, 48, 52; Guadalupe, 11; Hawaiian is., 304 (plate), 339, 384 (fig.), 385 (fig.), 386 (with fig.), 387 (fig.), 388 (fig.), 415, 416, 417, 421, 422, 425, 428, 429, 432, 433, 434, 438, 440, 446, 447, 450; Juan Fernández, 47 (plate), 59; Mangareva, 209 (plate), 227; Marquesas, 269, 278, 281, 282, 284, 288, 292, 295, 297; Niue, 564, 568, 571; Pitcairn, 80, 85–6, 85 (fig.); Rapa, 258, 262 (plate); Samoa, 606 (with fig.), 610, 652, 661, 662, 663 (fig.), 665, 666, 667, 668 (fig.), 670, 672 (fig.), 673, 674, 675; Society is., 107, 120–2, 150, 160, 161 (plate), 165, 166, 171, 177, 180, 184; Tokelau, 505, 507, 509, 516–17 (with fig.), 518; Tuamotu, 183 (plate), 194 (plate), 197, 208–9, 210–26 *passim*; *see also* Leprosy; Penal settlements; *and under* towns by name
Seventh Day Adventists, 86, 527, 615, 644–5; *see also* Adventists
Seymour, *see* Baltra; North Seymour
Shaddock, 567
Sharks, 16, 185, 196, 203, 213, 444, 464, 512, 553, 619 (fig.), 624–5
Shavay, *see* Haave
Shaveh, *see* Haave
Shaw, Savill and Albion Line, 90
Shearwater, 446
Sheep, 12, 62, 64 (plate), 69, 70, 71, 74, 77, 117, 257, 284, 296, 312, 373, 374 (and table), 430, 440

Shell Oil Co., 656
Shellfish, 82, 203, 464, 556, 567, 574; *see also* Clam
Shintoism, 340
Ship passes, Austral is., 243, 250; central equatorial is., 455, 476, 479; Cook is., 551, 561; Hawaiian is., 447, 448 (fig.); Mangareva, 230; Marquesas, 298; Samoa, 547, 662, 673; Society is., 142, 143 (plate), 145–7, 159, 167–9, 172, 173, 176, 179, 186; Tuamotu, 192, 195, 209–26 *passim*
Shipbuilding, 125, 126, 599; yards, 113, 150 (fig.), 151, 154
Shipping, 692; central equatorial is., 474–5, 478, 481, 483, 486, 491, 493, 494, 496, 497; Clipperton, 17; Cocos, 21; Cook is., 534–5, 539, 545, 546, 549, 551, 553, 556, 560, 562; French Oceania, 125–6, 154–5, 161, 161 (plate), 171, 178, 185, 189, 204, 209, 235, 237–8, 242, 249–50, 258, 274; Galápagos, 39; Guadalupe, 11; Hawaiian is., 338, 390, 395 (table), 399, 401–10 *passim*, 416, 417, 421, 422, 425, 429, 433, 434, 438, 440, 447; Juan Fernández, 60; Niue, 579; Pitcairn, 90; Samoa, 654, 656, 657, 662, 667, 673; Tokelau, 516, 519; trans-Pacific routes, 1, 2 (with fig.), 125, 154–5, 178, 180, 252, 274, 354, 377, 382–3, 392, 401, 434, 438, 534, 539, 594, 656, 660; *see also* Companies, shipping; Ports and harbours
Shooting Star, American ship, 485
Shore shelf, 19, 66, 263, 276, 284, 297, 492
Shrines, *see* Temples
Siapo (bark cloth), 626
Sida fallax, 463, 477, 486, 487, 496, 497
Signal communications; *see* Cable, submarine; Radio telephony; Telegraph; Telephone; Wireless telegraph
Sili (Olosenga), 674
Sili river (Savai'i), 586, 661
Silk, 314
Silversword, 311
Sisal, 117
Si'ufanga, 667, 669
Si'umu, 669
Sivasiva, *see* Dancing
Skin diseases, 515, 554, 577, 638
Slave raiding, *see* Labour traffic
Slipways, 154, 403 (fig.), 404, 656
Smallpox, 71, 354
Smith, Alexander, *see* Adams, John
Smuggler cove, 429
Snakes, 12, 20, 32, 590
Soatau (canoe), 625
Social and economic conditions, *see* Economics; Settlements; Social services, etc.
Social services, Cook is., 529–30, 545, 548, 559; French Oceania, 112–13, 160, 202, 234, 237; Hawaiian is., 341, 348, 350–6 *passim*; Niue, 576–7; Samoa, 638–46; Tokelau, 514–15; *see also* Education; Medical services
'Société Cotonnière Française', 116
'Société Industrielle Agricole de Tahiti', 151
Society islands, 4, 95, 98, 99, 100, 120, 136 (plates), 137 (plates), 142 (plates), 143 (plates), 150 (fig.), 151 (plate), 154 (plates), 155 (plates), 160 (plates), 161 (plates), 165 (plates), 182 (plates), 198, 207, 245, 249, 522, 525, 548, 599, 680; general description, 129–36 (with figs.); individual islands, 137–90
 Leeward group, 95, 101, 103, 108, 109, 110, 115, 121, 126, 129, 134, 155; description, 167–90 (with figs.)
 Windward group, 95, 129, 136; description, 137–66 (with figs.)
Society of Natural Sciences of Göttingen, 643
Sociology, *see under* names of peoples
Socorro, 11–12
Soils, Austral is., 236, 239, 242; central equatorial is. (general), 461–2 (with fig.), 481, 482, 484, 485, 489, 492, 493, 501; Cocos, 19; Cook is., 521, 538, 539, 542, 544, 545, 546, 548, 550, 554, 558; Easter, 66, 68; Galápagos, 27, 30, 43, 44, 46, 49; Hawaiian is., 308, 309, 365, 372, 429, 440, 445; Line is., 477, 480; Mangareva, 228, 231; Marquesas, 96, 267, 278, 284, 291; Niue, 564, 566, 574; Pitcairn, 81; Revilla Gigedo, 12; Samoa, 590, 674, 675, 676; Society is., 96, 141, 148–9, 160, 165, 170, 176, 183; Tokelau, 504, 506, 518; Tuamotu, 97, 196, 207, 218, 219, 220
Solanum viride, 506, 566
Solf, Dr, 599, 600
Solide, French vessel, 104
Solomon islands, 73, 76, 598
Sophora toromiro, 70, 76
South cape (Easter island), 67
South islet (Caroline island), 490
South Seymour, *see* Baltra
South Street (Honolulu), 398
South-east cape (Savai'i), 661
Southern Cross, aeroplane, 494

Sovereignty of Eastern Pacific islands, 3–4 (with fig.), 11, 691; *see also under* names of countries
Soviet Atlas, The, 452
Spain, 35, 59, 100, 323; *see also* Spaniards; Spanish language
Spaniards, 13, 21, 35, 59, 70, 282; Hawaiian is., 320, 328 (fig.), 341 (table), 344 (fig.), 345 (fig.), 359; explorers, 465, 518; *see also* Spanish language; *and under* proper names
Spanish language, 37, 59, 73, 685
Sparrow, 312
Sphagnum moss, 311, 418
Spreckelsville, 386, 422
Squid, *see* Octopus
Standard of living, 340, 366, 378–80, 692; *see also* Polynesian: Culture
Standard Oil Co., 393
Stanmore, Lord, 471
Starbuck, Valentine, 465, 488
Starbuck island, 454, 455, 456, 459, 465, 469, 470, 473, 485, 683; description, 488
Statues, 74–5, 75 (fig.), 76, 76 (plates), 77, 234
Stegomyia pseudoscutellaris, 591
Steinberger, Col. A. B., 595–6
Stephens bay, *see* Grande, Puerto
Steps, point, 670
Stevens, Captain, 596
Stewart, William, 121–2
Stilt, 33
Strawn's islet, 454 (plate)
Streams, *see* Rivers and streams
Stuebel, Dr, 596, 597
Submarine, depths, 13, 15, 18, 21, 54, 57, 129, 582, 585; ridge, 301, 582
'Submissive' islands (Paumotu), 103; *see also* Tuamotu archipelago
Subsidence, 18, 45, 50, 66, 68, 138, 262, 263, 281, 424, 426, 430, 439, 542, 543
Subsidies, 351, 371, 374, 377, 386, 404, 406, 594, 595, 597, 648
Success, ship, 20
Sueter airfield, 417
Sugar, 42, 48, 87, 89; cane, 70, 81, 231, 248, 271, 274, 284, 304 (plate), 305 (plate), 311, 377, 404 (plate), 539, 566, 571, 610; commercial production, 36, 38, 113, 116, 121, 151, 160, 161, 308, 319–20, 357, 358 (table), 359–67 (with tables and figs.), 369, 383, 395–6 (table), 400 (fig.), 401, 403, 404, 417, 433, 434, 436, 438; trade, 120, 252, 273, 380, 381 (table), 399 (table), 400, 402, 405, 407, 409, 410, 534, 653; *see also* 'Bagasse'; Molasses; Plantations: Sugar
Sugarloaf, 49
Sullivan bay, 49
Sulphur, deposits, 11, 37, 38, 260; emanations, 260, 261; trioxide, 303
Sulphur bay, 12
Sunday island, 568
Surveys, *see* Charts; Maps
Sutcliffe, Major, 56
Su'ulu passage, 662
Suva, 2, 478, 481, 516, 535, 577, 639
Suvarov, *see* Suvorov islands
Suvorov, Russian vessel, 561
Suvorov islands, 519, 524, 683; description, 560–1
Suwarrow, *see* Suvorov islands
Swains island, 504, 508, 515, 683; description, 518–9
Swallow island, *see* Canton island
Swamp hen, 567
Swamp lands, Austral is., 238, 243, 248; central equatorial is., 454, 455, 461, 463, 481, 498 (with fig.); Cook is., 520, 536, 537, 538, 542, 544, 545, 546, 548, 550, 558, 560; Galápagos, 47; Hawaiian is., 302, 311, 333, 418, 435; Mangareva, 235; Marquesas, 267; Samoa, 590, 622, 657, 666; Society is., 144, 150, 185; Tuamotu, 207, 211
Sweden, 598
Sweet potatoes, 38, 42, 70, 74, 81, 85, 149, 180, 231, 235, 248, 333, 522, 530, 539, 544, 548, 556, 566, 574, 578, 612, 622
Swinburn, Commodore, 488
Sydney (N.S.W.), 466, 469, 499, 534, 657
Sydney island, 454 (with fig.), 456, 460, 463, 464, 466, 467, 469, 470, 471, 472, 473, 474, 475, 500, 501, 683; description, 498–9 (with fig.)

Taahuku, bay, 98, 264, 266, 278; river, 276; valley, 276
Taaoa, 261; settlement, 278; valley, 275
Tablets, pictographic, Easter, 74, 76, 77
Taboo, 511, 575
Tacca pinnatifida, 149, 166, 180, 207, 231, 242, 245, 506, 531, 539, 562, 566, 647
Taenga, 195; description, 221–2
Tafa'ifa (Samoan title), 613
Tafiti, 563, 570
Tafua, mount, 665
Tagus cove, 14 (plate), 33, 50
Tahaa, 99, 103, 133, 172, 173, 174 (fig.), 175 (fig.), 177, 184, 680; description, 178–80; pass, 173
Tahanea, 195, 688; description, 222
Tahara point, 142, 143 (plate)
Taharoa pass, 146
Taharuu river, 144, 155 (plate)

Tahiti, 3, 4, 71, 72, 107, 111, 112, 129, 133, 136 (plates), 137 (plates), 142 (plates), 143 (plates), 150 (plates), 151 (plates), 155 (plates), 156, 163, 184, 205, 224, 257, 267, 271, 272, 334, 522, 538, 680, 691; administration, 108–10, 150, 201, 274; canoes, 109 (plate), 250; communications, 125–7, 178, 219, 235, 236, 242, 534; description, 137–55 (with figs.); economics, 115–22 *passim*, 235, 249, 274, 470, 471; history, 84, 85, 100–5 *passim*, 160, 184, 197, 198, 252, 525, 539, 568; language, 9, 108, 247, 270; ports, 98; *see also* Papeete
Tahiti Cotton and Coffee Plantation Company, 121
Tahiti Iti, 137, *see also* Taiarapu; Nui, 137, *see also* Tahiti
Tahitian chestnut, *see Inocarpus edulis*
Tahuata, 105, 260, 262, 263, 266, 269, 272, 273, 293, 681; description, 278–81 (with fig.)
Taiarapu peninsula, 137, 138, 140, 141, 142, 144, 146, 147, 155
Taiaro, 681; description, 223
Ta'imua, 600
Taioa, Port, 264, 288
Taiohae, 98, 112, 127, 261, 265, 266, 267, 269, 273, 274, 287; bay, 263 (plate), 288, 289 (fig.); settlement, 288–90, 302 (plate)
Taipi valley, 272, 274, 287 (with fig.)
Taipivai, 266, 288
Taitaa, Mt, 243
Takapoto, 199, 204, 211, 681; description, 212
Takaroa, 194, 195, 198, 199, 200, 204, 212, 681; description, 211–12
Taku, 233; bay, 230
Takuha pass, 551
Takume, 204; description, 221
Takutea, 519, 524, 683
Tamarind, 143, 149, 245, 567
Tamarua, 544
Tamasese (Samoan chief), 596, 597, 603
Tamasoali'i, 613
Tanager peak, 442
Tangaloa (god), 575
Tangiia (traditional chief), 539
Tapa (bark cloth), 626
Tapanga, cape, 666
Tapioca, 248, 539, 551, 651
Tapioi, Mt, 172, 176 (fig.)
Tapuaemanu, 129; description, 165–6 (with fig.)
Tapuamu bay, 179
Tapueraha pass, 142, 145, 146
Tapuhiria pass, 222
Taputapuatea (temple), 99, 136, 177
Taravai, 227, 230, 231, 232
Taravao, 112; bay, 142, 146; isthmus, 138, 139, 142, 144, 145, 147, 148, 155
Tareu pass, 159
Tariffs, *see* Taxes
Taro, Austral is., 239, 242, 245, 247, 248; central equatorial is., 463; Cook is., 521, 530, 538–48 *passim*, 551, 553, 556, 560, 562; Hawaiian is., 325, 333, 338, 340, 357, 358, 359 (with table), 360–64 (figs.), 371 (plate), 372, 398, 421; Mangareva, 231, 235; Marquesas, 271, 272, 274; Niue, 566, 574; Pitcairn, 81, 85; Rapa, 257, 262 (plate); Samoa, 610, 612, 622, 647; Society is., 117, 132, 149, 161 (plate), 170, 177, 184, 185; Tokelau, 506, 512, 518; Tuamotu, 196, 202, 213; giant, 208, 553, 556; trench cultivation, 202, 212, 219
Taruia pass, 551
Tataa point, 142, 143
Tatakoto, 198; description, 214
Tatane (Satan), 73
Tattler, *see Totanus incanus*
Tattooing, 272, 283
Ta'u, 582, 585, 673; description, 674 (fig.), 675
Tauauoho, Mt, 281
Tauere, 217–18
Tauhunu, 554, 556
Taulanga, 518
Taulele'a (commoners), 636
Tauma, 89
Taunganui, 548, 549
Taunoa, channel, 151, 153; harbour, 145; pass, 142
Taupo, *see* Rank (Polynesian), Samoa
Tautira, bay, 142, 144, 146; point, 142, 144, 146, 155; valley, 142 (plate)
Tautua, 551, 552, 553
Tavana (governor), 137
Taxes:
 Christmas, 478
 Cook is., customs duties, 529; export, 529
 France, import, on copra, 114; *see also* 'Prime'
 French Oceania, customs duties, 112; direct, 112, 248; export, 124; import, 112, 124, 154; 'Octroi de mer', 112, 124
 Hawaiian is., death duties, 351; import, 317; income, 351; property, 351; unemployment levy, 355
 New Zealand, import, on fruits, 150, 177

Taxes (*cont.*):
Niue, 576
Pitcairn, 88
Samoa, 636–7, 603, 604, 631
Tokelau, 514
United States, import, on copra, 115; on sugar, 360
Te (definite article), *see under* proper names
Teahupoo, 155
Teana, 219
Teavaro, bay, 159; village, 160
Teavera pass, 145
Teenui, 548
Tehere pass, 212
Tehutu, 260, 269
Teitei, Mt, 173
Tekokoto, 218
Telegraph, 127, 155; *see also* Wireless telegraph
Telephone, 127, 155, 378, 389, 417, 422, 426, 429, 435, 438, 475, 496, 542, 654, 660; *see also* Radio telephony
Temae, lake, 159, 160; village, 160
Temaketa pass, 211
Temanu, Mt, 181, 182
Temao, 207, 208, 208 (plate), 209
Temarauri, pass, 146
Tematangi, 201, 223, 225; description, 225
Tematoe, Port, 147
Temehani (Te Mehani), *see* Mehani
Temetiu, Mt, 275, 277 (fig.)
Temoe, 96, 232, 233; description, 236
Temperature, *see* Climate
Temples, Polynesian, 99, 100, 133 (fig.), 135, 136, 177, 200, 201 (fig.), 219, 233, 272, 315, 464, 488, 490, 500, 509, 513; Buddhist, 340; Shinto, 340
Tenararo, 224
Tenarunga, 224
Tepoto (Disappointment islands), 96, 219; description, 220–1
Tepoto (Raevski group), 681; description, 222
Teputo pass, 145
Terevaka, Mt, 65, 66, 68 (fig.), 78
Terii Maevarua II, Queen of Borabora, 184
Termites, 34
Terns, 70, 231, 245, 285, 312, 446, 464, 502, 624; grey, 496; noddy, 81, 87, 184, 464; sooty, 76, 295, 298, 462 (plate), 464, 487, 496, 676; white, 81, (fairy) 184, 496
Terrapin road, 41, 42
Territory of Western Samoa, *see* Samoa (Western)
Tertiary period, 56
Tetamanu pass (Aratika), 211
Tetamanu village (Fakarava), 210
Tetiaroa, 129, 164–5 (with fig.)
Tetobe pass, 250
Tetoroa bay, 176, 178
Teuaua, 295
Teva, 101
Tevaitahu, 254
'Tevaoroa ia Raka', canoe, 195 (plate)
Teveitoa, 176
Texas, 375
Thespesia populnea, 70, 149, 177, 207, 245, 267, 284, 310, 506
Thomas, Rear-Admiral Richard, 317
Thompson, William, 20
Thrum Cap, *see* Akiaki
Thrushes, 62
Thursday island, 478
Thyrsopteris elegans, 62
Ti, *see Cordyline*; Fire-walking
Tiano pass, 176
Tiare pass, 155 (plate), 167–8, 169
Tiavii valley, 241
Tidal waves, *see* Seismic sea waves
Tierra Blanca, Bahía, 61
Tikehau, 194, 195, 681; description, 213
Tikei, 96, 202; description, 212
Timber, 60, 70, 73, 74, 81, 92, 121, 161, 246, 375, 399 (tables), 471, 491, 506, 511, 513, 521, 523, 538, 545, 548, 554, 556, 577, 579, 611, 625, 653; imported, 89, 120, 126; *see also* Sandalwood
Times Atlas, The, 452
Timoe, *see* Temoe
Tiputa, pass, 183 (plate), 213, 681; village, 213
Tiriara, lake, 542
Tiriroto, lake, 548
Tithes, 88
Tiva, point, 179
Toahiva bay, 173
Toahotu pass, 179
Toamaro pass, 173
Toau, 195, 203, 681; description, 211
Tobacco, 112; cultivated, 117, 150, 161, 180, 248, 646; imported, 120, 407, 579, 653
Tohivea, 157, 158 (fig.)
'Toi, Great Road of', 540 (fig.), 541–2
Toini, pass, 222; village, 222
Tokelau group, 2, 4, 452, 453 (and fig.), 504, 518, 560, 645, 669; description, 504–17 (with figs.), 692
Tokelau ringworm, *see* Skin diseases
Toloa, 669
Tomatoes, 522, 530, 531 (fig.), 533 (fig.), 539, 545

Tonarutu, Mt, *see* Tunarutu
Tonga, 1, 3, 480, 507, 538, 562, 566, 567, 569, 571, 574, 587, 592, 593, 598, 613, 618, 625, 645, 656
Tongans, 269, 270, 271, 567, 570, 573
Tongareva, 480, 485, 490, 519, 520 (plate), 521 (with plate), 524, 525, 526, 531, 535, 562, 683; description, 551–3 (with fig.); population, 523 (table)
Tongariki, 78
Tools, shell, Polynesian, 513; steel, 89, 185; stone, Polynesian, 75, 228, 297, 513
Topaz, American whaler, 82
Topaze, H.M.S., 76
Toromiro, *see Sophora toromiro*
Torres straits, 561
Tortoise, giant, 30, 31, 35, 36
'Tortoise country', 46, 46 (plate), 48
Tortuga, 52
Totanus incanus, 184, 464
Totiko, 548
Touaouho, *see* Tauauoho
Tourist trade, 161, 323, 339, 377, 378, 379, 392, 398, 433, 434
Tournefortia argentea, 454 (plate), 463, 463 (plate), 477, 480, 483, 484, 490, 497, 499, 501, 554, 558, 560
Tovii, 267, 285, 288
Tower island, *see* Genovesa
Tracks, Cook is., 542, 545, 557 (fig.), 560; French Oceania, 126, 155, 161, 178, 209, 235–6, 242, 250, 258, 274, 278, 283, 285, 302 (plate); Galápagos, 39, 40, 48; Hawaiian is., 419 (fig.), 422, 426, 429, 438, 441; Juan Fernández, 60; Pitcairn, 77 (plate), 80, 90; Samoa, 654, 661, 664, 667–9 (with fig.), 673; Tokelau, 516
Trade:
 General, 692, 693; Cook is., 522–3, 539; French Oceania, 100, 101, 102, 120, 163; Hawaiian is., 314, 318, 338, 390, 402, 406; Pitcairn, 82, 87, 89–90; Samoa, 592, 593–5, 598, 627, 655
 Exports, Austral is., 242, 248–9; central equatorial is., 469, 470, 487, 490, 491, 493, 499; Clipperton, 17; Cook is., 529, 530, 531–4 (with figs.), 545, 546, 549, 551, 553, 556, 560, 562, 567, 576, 577, 578, 579; Easter, 78; French Oceania (general), 113–24 *passim*, 114 (fig.), 119 (fig.), 122 (table), 124 (fig.), 125, 151; Galápagos, 38; Hawaiian is, 359, 365, 367, 368, 370, 373, 374, 377, 380, 381 (with table), 399–400 (with table), 402, 404, 405, 407; Marquesas, 297; Rapa, 258; Samoa, 647–54 (with figs.), 657; Society is., 150, 161, 171, 177, 178; Tokelau, 515; Tuamotu, 202, 204, 208, 211, 223
 Imports, Cook is., 531, 534; French Oceania (general), 107, 120, 122 (table), 123, 124 (with fig.); Hawaiian is., 314, 347, 353, 374, 380, 381, 382, 399–400 (with table), 402, 404, 405; Niue, 579; Phoenix is., 495; Samoa, 608, 653 (with table); Tokelau, 515; *see also* 'Prime'; Taxes
 Internal, Austral is., 255; Hawaiian is., 338, 340, 341, 375, 376, 399–400 (with tables), 409, 438; Samoa, 660, 657; Society is., 151, 161, 163; Tuamotu, 204
 See also Barter; Economics; Shipping; Traders
Trade Unions, *see* Labour organizations
Trade winds, 147, 161 (plate), 241, 407, 409, 435, 666, 673, 675; *see also* Climate
Traders, 100, 104, 105, 310, 312, 313, 316, 325, 346, 356, 390, 507, 622; Chinese, 107, 151, 171, 177, 178, 180, 185, 189, 203, 215, 239, 248, 249, 252, 278; European, 120–2, 313, 314, 337, 523, 534, 545, 552, 562, 592, 595, 596, 601, 602, 647
Traitors bay, 275, 278
Tramways, central equatorial is., 470, 487 (with fig.), 491, 498 (with fig.), 499, 541, 550; Clipperton (disused), 17; Honolulu, 304; Laysan (disused), 446; Samoa, 668 (fig.), 669; *see also* Railways
Transit, British whaler, 466, 497
Transport, 209, 221, 318, 351, 367, 374, 375, 393; *see also* Communications; Motor vehicles; Railways; Roads; Shipping; Sailing craft
Treasure, buried, 20–1, 215
Treaties, *see under* names of countries
Trees, *see* Vegetation; *and under* names of individual genera and species
Tribulus, 450
Tridacna, 203, 214, 219, 223, 553, 556, 562
Triumfetta, 496; *semitriloba*, 70
Tropic birds, 33, 70, 231, 245, 312, 444, 464, 549
Tropical cyclones, *see* Hurricanes
Tu (god), 233
Tu (Pomare), *see* Pomare I (Tu)
Tuamalua (long-boat), 625
Tuamasanga, 613, 628 (table), 668 (fig.); East, 628 (table); North, 628 (table); South, 628 (table); West, 628 (table)

Tuamotu archipelago, 2, 4, 95, 96, 97, 99, 102, 103–4, 108, 109, 110, 113, 118, 121, 126, 127, 130, 135, 232, 235, 245, 249, 264, 272, 471, 680–1; general description, 183 (plate), 192–205 (with figs. and plates); general map, 193; islands, 205–26 (with figs.)
Tuanae, 186
Tuanaka, 223
Tuanake, *see* Tuanaka
Tuapa, 564
Tuasivi, 638, 664; cape, 661
Tuauru, valley, 143
Tubai, 680; description, 186
Tuberculosis, 88, 112, 354, 512, 638
Tubuai (Austral islands), 104, 237, 242, 252, 681; description, 242–50 (with fig.)
Tubuai (Rapa), 258
Tubuai Manu, *see* Tapuaemanu
Tuff, *see* Rocks, volcanic
Tufukia, 577
Tuheiava pass, 213
Tui Manu'a (Samoan title), 601, 613, 614
Tui Tokelau (god), 513
Tuiaana (Samoan title), 613
Tuiatua (Samoan title), 613
Tuimaleali'ifano (Samoan chief), 604
Tukou, 554
Tulafale, *see* Rank (Polynesian), Samoa
Tumakohua pass, 210
Tumua, 600, 613
Tuna, 359, 376
Tunarutu, Mt, 243
Tunoa, 286
Tuohoa plateau, 276
Tupana, 211
Tupapati, 218
Tupeka plateau, 276
Tupua (Borabora), 180, 182
Tupua, family, 591, 592, 596, 613
Tupuai (Austral islands), *see* Tubuai (Austral islands)
Tupuai (Rapa), *see* Tubuai (Rapa)
Tupuaiehitu, 243
Tupuaiti (Borabora), 180, 182
Turaapuo, bay, 182; village, 184
Turakina passage, 549
Tureia, 223; description, 225
Turi, Mt, 167
Turkeys, 117, 151, 249
Turmeric, 81
Turnbull, Captain, 518
Turnbull, John, 222
Turnstone, 464
Turtle, 20, 31, 185, 186, 196, 203, 216, 220, 444, 446, 464, 466, 494, 500, 553, 676; shell, 624
Turtle cove, 50
Tutataroa pass, 146
Tutuila, 537 (plate), 582, 585, 586, 586 (plates), 587, 587 (plate), 590, 591, 592, 594, 598, 601, 604, 606 (with fig.), 613, 629, 642, 644, 645 (plate), 647, 648, 657 (fig.), 673, 684; description, 669–73 (with figs.); *see also* Pango Pango
Tuuhora village, 223
Tuutapu, 65 (plate)
Two Groups, 217
Typee, 287
Typhus, 354

Uafato bay, 684
Uahakekua, 272
Uahuka, 104, 260, 262, 264, 265, 266, 269, 272, 273, 681; description, 293–5 (with figs.)
Uapou, 104, 260, 262, 263, 266, 267, 269, 271, 273, 681; description, 290–2 (with figs.)
Uia, 282
Umu ti, *see* Fire-walking
Union islands, *see* Tokelau group
Union Steam Ship Co. of N.Z., 125, 154, 481, 541, 656
United States: 35, 340, 342, 366, 369, 379–80, 490, 491, 495, 578, 683, 691, 693
 Administration, central equatorial is., 473, 493, 494; Hawaiian is, 347, 348–56 *passim*, 374, 375, 381, 386, 402, 446; Samoa (American), 582, 601–2, 627–60 *passim*
 Congress, 338, 347, 349, 468, 472, 484, 602
 Exploring Expedition, 194, 226, 466, 491, 497, 500, 507, 518, 592, 681, 683; *see also* Wilkes
 Government departments, 350, 353, 450, 473, 682; Army, 304, 394 (table), 651, (Map service) 678; Bureau of Census, 337, 374; Coast and Geodetic Survey, 678, 682; Coastguard Service, 496, 497; Geological Survey, 678, 682; Hydrographic Office, 6, 194, 678–84 *passim*, 688; Navy, 4, 394 (table), 450, 451, 484, 601, 641
 Naval activity, 104, 316, 318, 322, 475, 595, 597, 601, 629, 637; defence area, 472, 473, 475, 484, 485; establishments, 37, (Hawaiian is.) 430, 433, 447–51, (Samoa) 589, 594, 601,

United States (*cont.*):
606, 640, 641, 642, 652, 653, 657–60 (with figs.), 673, 692
Sovereignty, 4; central equatorial is. (general), 468, 472; Hawaiian is., 300, 313–23 *passim*, 326, 348, 349–80, 383, 597; Line is., 475, 484, 485, 486, 493; Samoa, 591–602 *passim*; Swains, 504, 508, 518
Trade, 692, 693; central equatorial is., 471; French Oceania, 115, 117, 118, 120, 123 (with fig.), 124; Hawaiian is., 319, 320, 323, 347, 360, 365, 367, 370, 371, 374, 381 (table), 383, 394 (table), 407; Samoa, 653 (with table), 654 (fig.)
Treaties, 316, 318, 319, 320, 360, 380, 490, 491, 594, 595, 596
University of Hawaii, 352, 353, 375, 382
Unshelm, August, 593
Upolu, 582, 583 (fig.), 585, 586, 587, 587 (plate), 589, 590, 598, 600, 605, 606, 613, 628, 634, 635 (fig.), 638, 639, 642, 644, 644 (plate), 645, 645 (plate), 646, 648, 654, 655, 656 (fig.), 662, 664, 665, 684; description, 665–9 (with fig.); *see also* Apia
Upolu point, 417
Uramoa (False) pass, 167
Urufaatiu, 186
Uturoa, 112, 116, 127, 172, 173; administration, 108, 110; port, 176, 178, 180; settlement, 176 (fig.), 177
Uvea (Wallis island), 1, 3, 507

Va'aifetu peak, 665
Va'a-o-Fonoti, 628 (table)
Vacuum Oil Co., 656 (table)
Vahanga, 224
Vahinatika, 222
Vahitahi, 194 (plate), 198, 203, 223, 224, 225; description, 214–15
Vaiaeho bay, 173, 176
Vaiau, pass, 146; port, 146
Vaiea, 189
Vaieo, bay, 290, 292
Vaiere, bay, 159; pass, 159
Vaihi pass, 147
Vaihiria, lake, 141–2; river, 144
Vaihu, 67
Vaihuna, stream, 183
Vailele, 651; bay, 667
Vailima, 657
Vailoa, 669
Vaimaangu, 604
Vaiore bay, 179
Vaiotaha (temple), 100, 184
Vaipae valley, 276
Vaipaee, anchorage, 295; valley, 293, 294 (fig.); village, 295
Vaipio, stream, 276
Vaipule, 642
Vairaatea, 214, 681; description, 215
Vairahi, bay, 173
Vairao, Port, 146
Vaisingano, stream, 586; district, 628 (table), 663 (fig.)
Vaitahu, 279, 280
Vaitape, 127, 182, 182 (plate), 183, 184, 185
Vaitepaoa, 127, 205, 208, 209
Vaitepiha river, 141, 142 (plate), 144
Vaitia, 186, 189
Vaitoare, Port, 142, 147
Vaitoare (Tahaa village), 179, 180
Vaituha, 296, 297
Vaitupo, stream, 276
Vaitupu, 508
Vaka, Te (chief), 507
Valleys, drowned, 18, 261, 263, 292, 666; hanging, 263, 276, 413, 418, 435, 441, 586, 665; *see also* Ravines; *and under* proper names
Valparaiso, 317, 593; province, 56
Vanavana, 223; description, 225
Vancouver, Captain George, 256, 257, 312, 316
Vancouver, island, 481
Vanilla, 109 (plate), 115; export, 119 (fig.), 122, 123, 124, 150, 161, 170, 171, 177, 178, 180, 183, 185, 189, 208, 237, 242, 248, 265, 274, 539, 646
Vatia bay, 670
Vavau (Society is.), 180; *see also* Borabora
Vava'u (Tonga), 562
Vavitao, *see* Raivavae
Vegetables, 20, 38, 42, 48, 52, 60, 81, 107, 117, 151, 154, 161, 170, 171, 177, 189, 248, 252, 340, 353, 358, 369, 381, 382, 399 (tables), 480, 495, 521, 522, 539, 634, 692; *see also* Market gardening, *and under* names of individual species
Vegetation:
Austral is., 227, 239, 242, 243, 245; central equatorial is., 454 (fig.), 454 (plates), 460, 462–3, 462 (plates), 463 (plates), 477, 480, 481, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 496, 498–9, 500, 501, 502, 504; Clipperton, 16; Cocos, 19–20; Cook is., 521, 538, 542, 544, 548, 554, 558, 560, 561, 562; Easter, 68, 69–70; French Oceania (general), 96, 97–8, 99; Galápagos, 15 (plate), 28–30, 33

Vegetation (*cont.*):
(plate), 39, 40, 43, 45–6, 46 (plate), 52, 53; Guadalupe, 11; Hawaiian is., 309–12, 375, 414, 418, 424, 426, 427, 440, 442, 444, 445, 446, 447, 449, 450; Juan Fernández, 58, 62–3, 64; Malpelo, 21; Mangareva, 227, 231; Marquesas, 265, 266, 267–8, 282, 284, 285, 291, 293, 294, 296, 297, 298; Niue, 566; Pitcairn, 81; Rapa, 227, 256; Revilla Gigedo, 12, 13; Samoa, 586, 587 (plate), 590, 665, 670, 674, 675, 676; San Felix and San Ambrosio, 55; Society is., 130, 150, 170, 177, 183–4, 188; Tokelau, 506, 518; Tuamotu, 196, 207–8, 211–26 *passim*
Introduced, 62, 63, 149, 150, 207, 231, 268, 309, 310, 311, 463, 483, 491, 506, 521, 538
See also Forests *and under* plants
Venereal disease, 77, 269, 354, 545, 570
Vénus, French frigate, 100
Venus, transit (1769), 100, 143
Venus point, 136 (plate), 142, 143, 145, 147, 155
Verbena, 310
Verdugo, El, 61
Veronica, H.M.S., 683
Versailles, Treaty, 602
Vettor Pisani, Italian ship, 679
Victoria island, 485
Villamil, Don José, 36
Villamil, settlement, 36, 37, 39, 50, 52
Vincennes island, *see* Kauehi
Vines, 117, 310; *and see under* names of types
Vipihai, *see* Traitors bay
Virago, H.M.S., 70
Virgins bay, *see* Hanavave
Vogel, Hon. Julius, 594
Vostok island, 452, 453, 454, 460, 465, 469, 473, 485, 683; description, 489 (with fig.)
Vulcanism:
Easter, 65, 66–7 (fig.); Galápagos, 22–4, 28, 39, 49, 50, 52; Hawaiian is., 301, 302–4, 303 (plates), 413–15 (with fig.), 418, 424, 426, 431, 442; Juan Fernández, 56–7; Marquesas, 260–1; Revilla Gigedo, 11; Samoa, 585–6, 660, 661; San Felix and San Ambrosio, 55; Society is., 129
Eruption, 15 (plate), 23, 24, 35, 47, 52, 302–4, 414–15, 585 (with fig.), (submarine) 303, 585
See also Cones; Craters; Island types: Volcanic; Lava
Wafer, Lionel, 19
Wafer bay, 18 (fig.), 19, 20, 21
Wafer islands, 18 (fig.)
Wahiawa (Kauai), 437
Wahiawa (Oahu), 367, 383
Waiakea creek, 371 (plate), 402
Waialeale, mountains, 301, 306, 307, 435
Waialeale, S.S., 383
Waialua, 433; plain, 433, 434, 435
Waianae, 434, 435, 682; mountains, 369, 431, 438
Waikahalulu bay, 429
Waikiki, 377, 398, 432
Wailoku, 424
Wailua (Maui), 422
Wailua river (Kauai), 435, 437
Wailuku, 339, 402, 420, 421, 422
Waimanolo bay, 433, 434
Waimanu valley, 416
Waimea (Hawaii), 417; plateau, 413
Waimea (Kauai), 314, 437, 438; river, 435
Waimea bay (Oahu), 433
Wainiha river, 435, 437, 438
Waiohinu, 417
Waipahu, 434, 435
Waipio gulch, 416
Wake island, 389, 449
Wakeman, Captain, 594
Wale, 557, 559 (fig.)
Wallis, Captain Samuel, 100, 101, 156, 161, 165, 214, 216
'Walnut' (Borabora), 183, 184
War, 1914–18, 527, 600, 601
War, Sino-Japanese, 120
Warbler, 33
Warfare (Polynesian), Cook is., 527, 544, 553; Easter, 71; French Oceania, 99, 101, 102, 105, 197, 219, 223, 233, 247, 257; Hawaiian is., 312, 313, 333; Niue, 563, 567, 574–5; Samoa, 592, 595, 597, 598, 605; Tokelau, 507, 508; *see also* Forts, Polynesian
Wars of Liberation, Spanish-American, 35
Washington island (Line islands), 454, 456, 459, 461, 463, 464, 469, 470, 471, 473, 474, 475, 477, 480, 484; description, 481–3 (with figs.)
Washington island (Marquesas), *see* Uahuka
Water supply:
Austral is., 227, 236, 245; central equatorial is. (general), 472, 474, 492, 493; Clipperton, 15, 16; Cocos, 19; Cook is., 521, 545, 546, 548, 549, 550, 551, 554, 558, 560, 561; Easter, 64 (plate), 68–9; Galápagos, 40, 41, 42–3, 44, 47, 49, 52, 53; Guadalupe, 10;

Water supply (*cont.*):
Hawaiian is., 308–9, 358, 366, 373, 375, 388 (fig.), 393, 401, 402, 403, 404, 405, 406, 407, 411, 427, 429, 430, 442, 444, 446, 447, 449; Henderson, 92; Juan Fernández, 61, 64; Line is., 477, 479, 485, 486, 487, 488, 489, 490, 491; Malpelo, 21; Mangareva, 227, 230, 231; Marquesas, 266–7, 276, 278, 279, 280, 282, 284, 285, 287, 288, 290, 298; Niue, 564, 565, 566; Oeno, 91; Phoenix is., 495, 496, 497, 498, 499, 500, 501; Pitcairn, 81; Rapa, 227; Revilla Gigedo, 12; Samoa, 638–9, 657, 660, 664, 674, 676; Society is., 148, 153, 154, 160, 163, 165, 170, 176, 179, 183, 190; Tokelau, 504, 506, 514, 516; Tuamotu, 196, 207, 211–25 *passim*
From evaporating plant, 474, 487, 495
Piped to port, 153, 170, 176, 179, 183, 207, 230, 231, 266, 290, 393, 401, 402, 403, 404, 405, 406
Waterfalls, 19, 63, 141, 142 (plate), 254, 263, 276, 296, 586, 661, 665
Waterland, *see* Manihi
Watts, Lieut., 552
Weather, *see* Climate
Webb, William H., 594, 595
Webb cove, 50
Weber, Theodor, 593, 594, 597, 647
Welles harbour, 447, 448 (fig.), 449
Wellington (N.Z.), 528, 534, 535, 580
Wellington, H.M.S., 683
Wells, *see* Water supply
Wenman, 21, 31, 54
Wesleyan Missionary Society, *see* Methodists
West bay, *see* Oeste, Bahía
West Palm valley, 442
West pass (Tongareva), 551, 552 (fig.)
Western Samoa, Mandated Territory, *see* Samoa (Western)
Weston, David M., 377
Whale rock, 658
Whaler anchorage, 479, 480
Whalers, 20, 31, 35, 36, 44, 70, 82, 100, 104, 105, 282, 288, 312, 318, 319, 325, 337, 369, 373, 389, 390, 409, 466, 467, 493, 494, 500, 502, 518, 523, 538, 560, 568, 591, 593
Wharves, French Oceania, 153, 170, 176, 151 (plate), 154 (plate), 161 (plate), 213, 222, 230; Hawaiian is., 383 (plate), 392, 393, 394–6 (table), 398, 398 (plate), 399, 401 (with table), 402–11 *passim*, 404 (plate), 405 (plate), 421, 428, 433, 437, 449; Samoa, 655, 656 (fig.), 657, 658 (with fig.); *see also* Jetties and piers; Quays
Wheat, 381
Whippoorwill Expedition, 683
Whitsunday island, *see* Pinaki
Wiliwili, *see Erythrina monosperma*
Wilkes, Captain Charles, 466, 500, 501, 502, 592, 604, 675, 681
Williams, John, 527, 538, 544, 548, 567, 591, 592, 645
Williams, John C., 592
Williamson, Balfour Company, 69, 71, 72, 74, 77, 78
Wilson, Captain James, 136, 214, 232, 236
Windmills, 69, 480
Winds, *see* Climate; Trade Winds
Wines, 117, 120
Wireless telegraph, central equatorial is., 475, 478, 481, 483, 486, 493, 496, 497, 499, 500, 516, 518; Cook is., 535, 542, 544, 545, 546, 549, 551, 553, 556, 560, 561; Easter, 78; French Oceania, 127, 155, 161, 177, 178, 185, 205, 209, 236, 238, 242, 258, 274, 278, 290; Galápagos, 39; Hawaiian is., 384 (fig.), 387 (fig.), 388 (fig.), 389, 417, 435; Juan Fernández, 60; Niue, 580; Pitcairn, 90; Samoa, 654, 656, 659 (figs.), 663 (fig.), 664, 668 (fig.), 669, 672 (fig.), 673
Wireless telephones, *see* Telephones
Wittgenstein, *see* Fakarava
Wool, 77
Wreck bay, *see* Chico, Puerto
Wreck point, 40
Wrecks, bay of, 455
Wyllie, William, 317, 318

Yams, 70, 74, 81, 149, 180, 245, 248, 310, 531, 549, 544, 548, 566, 574, 610, 612, 622; *see also Otoya*
Yato, 558
Yaws, *see* Framboesia
'Yellow elder', 149
Yorktown, U.S.S., 17, 679
Young, John, 313, 318
Young's rock, 79
Young's Tooth, 536, 536 (plate)
Yunque, El, 60, 61 (fig.)

Zaca, yacht, 680
Zembsch, Captain, 596

PRINTED UNDER THE AUTHORITY OF
H.M. STATIONERY OFFICE
AT THE UNIVERSITY PRESS, CAMBRIDGE

"A book that is shut is but a block"

CENTRAL ARCHAEOLOGICAL LIBRARY

GOVT. OF INDIA
Department of Archaeology
NEW DELHI.

Please help us to keep the book clean and moving.

S. B., 148. N. DELHI.